Wind Cave

National Park Service

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Handbook 104

Wind Cave

National Park, South Dakota

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About This Book

Wind Cave National Park in the Black Hills of South Dakota offers travelers a variety of experiences below and above ground. The major attractions are the cave itself and its unusual boxwork formation. Bison and other wildlife of the prairie are also of prime interest. Part I of this handbook, published in support of National Park Service interpretation at the park, gives a brief introduction to what you might expect to find in a leisurely visit to the park; Part II traces the history of the early explorations of the cave and discusses the natural history resources; and Part III presents concise guide and reference materials.

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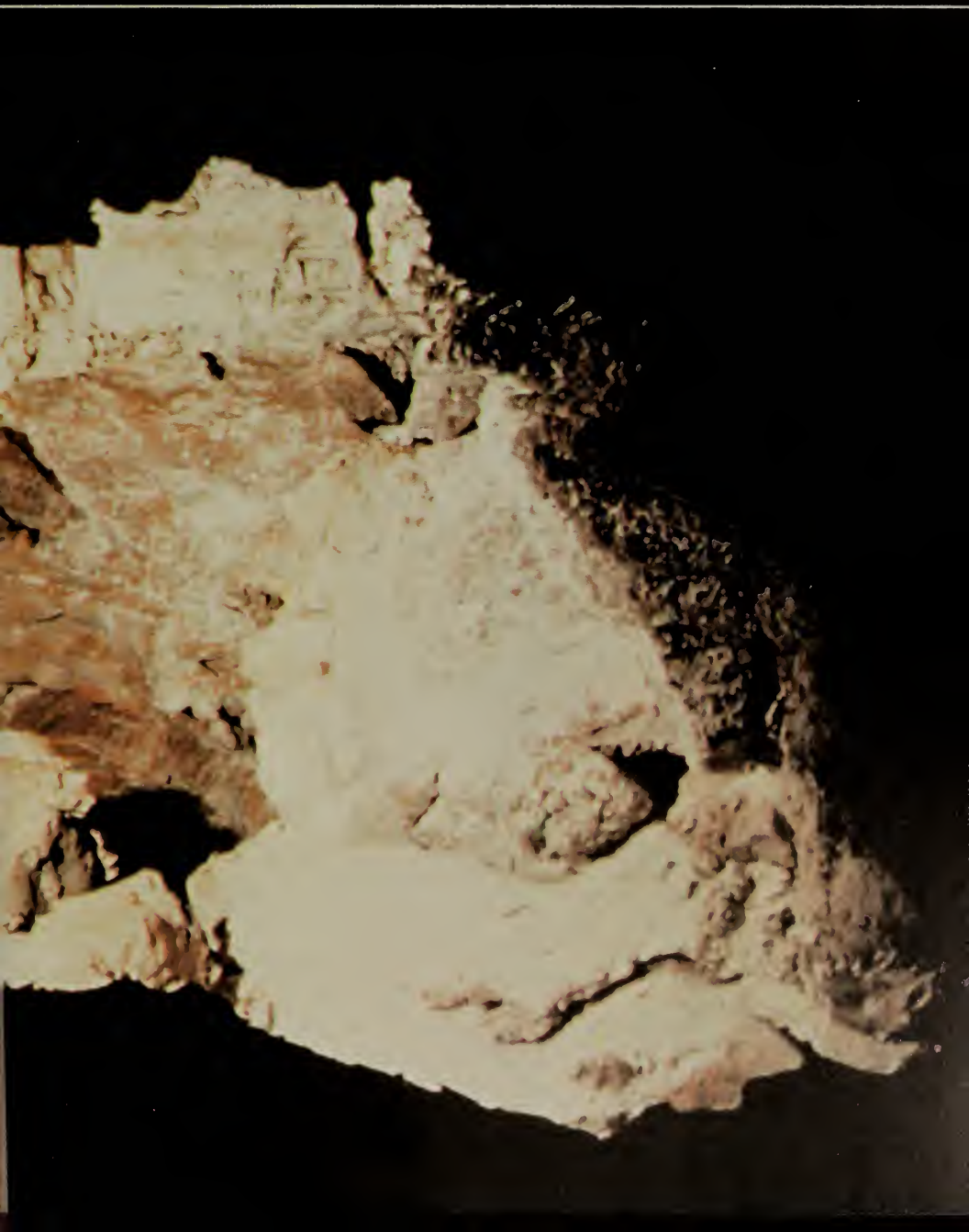
Welcome to Wind Cave



Bison grazing on the open grasslands at Wind Cave National Park evoke feelings of days gone by when millions of these massive animals roamed the Great Plains. Above ground, the park is a preserve for these and other animals.

Two Parks in One

You are standing high on a rocky ridge in the Black Hills. The summer wind is singing in the ponderosa pines. Below you to the southeast, the sun and the shadows of the day's clouds are laying an everchanging artistic pattern of light and dark on the valley floor. A red-tailed hawk swings overhead, floating gently on the currents of air along the ridge. In the distance in the valley, three small herds of bison graze on the summer grasses.

You are standing on ancient land, and you are lost in time. You are seeing the land as the Indians might have seen it a century or so before. Your vantage point is Rankin Ridge in the southern Black Hills. At 1,528 meters (5,013 feet), the ridge is the highest point in Wind Cave National Park.

One stream bed winding east from where you stand is Beaver Creek. Off in the distance, in an imposing ridge between hills and prairie, you see historic Buffalo Gap, carved there over time by the creek. Indians and white travelers followed this route in and out of the hills in the early days.

Now, for a moment, your scene changes. You're no longer at the highest point in the park. You're 55 meters (180 feet) below the surface in the cave, having followed some 20 to 30 visitors and a park guide into the depths. The guide asks, "Do you know what darkness is?" and you think, yes I do, having seen the darkest of nights. But then the guide puts out the lights, and you see the real dark. You see nothing but blackness.

Welcome to Wind Cave. There are really two parks to visit, one above ground and one below–one a world of light, the other a world of darkness. You'll likely be delighted and enchanted by both.

Above ground, you'll see bison, elk, pronghorn antelope, mule deer, and prairie dogs. You'll see a great variety of birds and plants; the area is one in which "East meets West," in which the eastern and western ranges of many birds and plants join. And don't be too surprised if your drive through the park is halted by a buffalo bull ambling across the roadway.

Below ground, you'll be introduced to a world of

boxwork, popcorn, and frostwork, three of the more common formations in the cave. No other known cave in the world has such extensive formations of boxwork. You'll see how the water, millions of years ago, worked its natural wonders on the limestone bed, carving out a spectacular labyrinth and creating rooms large and small. You'll hear stories of the cave's early private developers, and of how a foresighted young man, Alvin McDonald, kept a diary of those explorations.

On a summer's day, high atop Rankin Ridge, or in the cool depths of the cave, it's not difficult to imagine times past. A visitor to Wind Cave soon feels the link. Perhaps it's the presence of the bison. Perhaps it's the sense of history that permeates the cave. Perhaps it's the knowledge that the hills are so ancient that happenings a century or so ago seem like only yesterday.

Listen to the words of Lt. Col. Richard Irving Dodge, who came into the Black Hills in 1875 and passed through the park area with an exploring party: "From its [Beaver Creek's] north bank stretches a barren plain, bounded at a distance of from two to five miles by a line of steep and rugged hills from four to eight hundred feet above the plain . . . the 'outer rampart' of the Black Hills. Over the tops of these appear ridge after ridge, mountain after mountain, until the grand black mass blends with the blue of the skies."

From Rankin Ridge and other overlooks, you can see the "grand black mass" about which Dodge wrote. The Indians saw it much earlier, too, and so they named the region "Paha Sapa," or "Hills Black." To the Indians, the hills were and are sacred, the home of the Great Spirit. Some early accounts said that because the Indians so revered or feared the spirits in the hills, they rarely came into them. Other accounts said, however, that they followed the buffalo off the prairie through Buffalo Gap to the mountain grassland, and that they camped in the hills in the winter.

The Indians aren't the only ones who have been captivated by the mystique of the Black Hills; others have felt the same attraction and have made their homes in the hills.

The Black Hills cover 2,316 square kilometers (6,000 square miles) in South Dakota and Wyoming.

Today, rangers in period dress conduct historical candlelight tours to give you a sense of how folks explored the cave at the turn of the century. Back then spelunkers used twine to keep track of their route; today, many use pieces of colored tape or ribbon. Whether they be historians, naturalists, or rangers, National Park Service employees are here to help you see and enjoy the park.

They are not hills at all but small mountains. They were formed some 60 million years ago when pressure from below caused the earth's crust to bulge upwards. The southern hills, those around Wind Cave National Park, are not as high as those to the north. Harney Peak, nearer Mount Rushmore, at 2,207 meters (7,242 feet) is the highest point in South Dakota.

If you come into the Black Hills from the east along Interstate 90, you'll see Badlands National Park off in the distance to your left. Your first stop in the hills likely will be in Rapid City.

If you come in from the west, you'll probably pass through Sundance, Wyoming, and then into Spearfish, Deadwood, and Lead in the northern hills. Or if you come through Newcastle, Wyoming, you'll end up in Custer. In either case, you'll be in "gold" country. Lead is the home of the Homestake mine, one of the largest in the world. Custer is the locale of small gold finds made by members of Gen. George Custer's expedition to the Black Hills in 1874; trumped-up reports of those and subsequent discoveries touched off a rush to the hills around 1876.

If you come into the Black Hills from the south, across the sandhills of Nebraska, you'll pass through the "gateway" to the southern hills, Hot Springs, a quiet community of about 4,500 people that was once world renowned as a spa because of its warm mineral springs. Near Hot Springs is Battle Mountain, where, it is said, the Sioux Indians defeated the Cheyenne in a fight for control of the springs. The Sioux believed that a mighty god dwelt in the spring waters, "and that he drove away their aches, pains and evil spirits."

Just north of Hot Springs along Highway 385 is Wind Cave. The park covers 11,353 hectares (28,060 acres) of prairie, forested ridges, canyons, and mountains, and it harbors a wealth of plant and animal life.

Below ground are 49 kilometers (30.5 miles) of explored caverns, making Wind Cave the fourth largest in the United States and one of the 10 largest in the world.

Little bluebells on long, thin stems blow in the slightest of breezes, spotting the forest floor with blue dots.

The Hot Springs-to-Wind Cave route is closely tied to the history of the cave. The early private developers of the cave, two families named McDonald and Stabler, came to Hot Springs to work

and in the 1890s became involved in exploration of the cave. Many turn-of-the-century tourists came first to Hot Springs by railroad to enjoy the warm-water springs, then made the trip north by tallyho stage to see the sights of "Wonderful Wind Cave."

Early visitors used wooden ladders and ropes to explore the cave; they often used string to mark their pathway for a safe return, and they carried candles for light. They had to squeeze through some routes and occasionally even became stuck in the passageways. Modern visitors are taken through an area known as Roe's Misery, where, in an earlier day, one Charlie Roe got stuck and had to be pulled out. But don't worry; Roe's Misery has been enlarged. Visitors today will find lighted stairways and firm footing along cave routes used for the walking tours. Park guides provide four kinds of interpretive tours: short, long, historical, and spelunking. The cave is open for tours every day except December 25 and January 1.

Above ground, the seasons come and go, but below ground, they never change. Winter or summer, the cave's average temperature is approximately 12°C (53°F).

On your initial visit to Wind Cave National Park, it's likely you'll tour the cave first before extensively exploring the sights above ground. Though you don't enter through the same hole that early explorers used, you'll still feel the wind blowing in or out, sometimes quite strongly depending on the day's atmospheric conditions, and you'll understand how Wind Cave got its name.

On the cave's regular tours, you'll descend deeper and deeper along concrete stairways and asphalt paths. You'll begin to feel the coolness and to sense the special cave world. Along the way a guide will explain the geology and will point out areas explored and named by early developers. You'll see, for example, the Post Office, a formation of boxwork for which Wind Cave is well known. Blades of calcite projecting from the ceiling appear to form boxes similar to those in a post office, and in earlier days, cave visitors left messages in the boxes for others to read. You'll see hundreds of huge limestone rocks that fell to the cave floor millions of years ago as the water seeped into the limestone and formed the cave. You'll be told that you're in one of the oldest

caves in the world, perhaps the oldest in North America; geologists estimate that the major phase of the cave's development came 10 million to 40 million years ago, and there's some evidence that it's much older.

In the summertime, you'll notice some moisture on the cave path and an occasional drop of water may hit your head. But Wind Cave, in its upper reaches, is essentially dry, so little solution activity is taking place; thus the cave is known as a "dead" one. Except for a small outcropping near the cave entrance, you won't see stalagmites or stalactites. You'll see only a few dripstone formations, those created by the flow of water over the limestone. There are lakes in the cave, but they're far from the routes followed by most visitors; it takes a good 8 to 10 hours of walking and crawling to get to such areas. This gives you an idea of the extent of the cave. Those most knowledgeable say that there are as many as 3,000 points from which new explorations could depart; if and when these routes are explored, Wind Cave may well challenge the records for the world's longest cave.

Because there's little moisture in the cave, there's little wildlife, too. An occasional bat or pack rat may be seen but they are not common.

As you descend in the cave and hear more stories about the early cave explorers, your appreciation of those men and women likely will increase. Imagine now that you're Alvin McDonald, the young diarist and cave explorer. The year is 1891, and you are crawling alone in the near darkness some 55 meters (180 feet) below the surface. You are struggling to get through a tight opening, and your candle goes out. You really see the dark, and you hear a silence that rarely will be heard above the ground. Finally, you find a match and relight your candle, and you push on through the small opening. You come suddenly into a massive cavern. The flickering candlelight plays against the sharp contours of the ceiling in a beautiful yet mysterious way. The fallen limestone rocks cast huge shadows, adding to the drama. You are the first person to have seen this room, a room formed millions of years earlier. You are lost in time.

Hard to imagine? Probably not, especially if you take one of today's cave tours. In fact, on the short

Prairie dogs at play delight people of all ages, especially children. These "barking squirrels," as William Clark of Lewis and Clark fame called them, have been the victims of extensive eradication programs. In the park they are protected.

Movement in the distance brings three mule deer bucks to attention as they rest on a prairie slope.

or long tours, don't be surprised if you encounter an old gentleman in black top hat, black clothes, and white shirt making his way along the path by candlelight. He'll likely ask you what you're doing in the cave, and you may wonder the same about him. He's leading one of the cave's historical tours, in which park guides play the parts of persons of the past and interpret the history of the cave.

Unlike the explorers of the past who had to climb long ropes or ladders out of the cave, you are whisked by an elevator from the cool, dark depths to the surface.

Your visit to Wind Cave has ended, but your visit to the national park has just begun.

Above ground, the links with the past continue in the form of the bison or buffalo. A carefully managed herd of about 350 animals roams the park's prairie lands. When seen in the open, the massive bison evoke an image of earlier days when they dominated the plains by the millions and the Indians and the white settlers hunted them for a livelihood. Today's herd is the result of the establishment of a wildlife preserve in 1913 with 14 bison.

As you drive into the park across Bison Flats on Highway 385, you may see the bison, depending on the season, and if you watch carefully, you'll likely see some of the 100 or so pronghorn antelope in the park. Such scenes conjure up the old song: "Oh give me a home where the buffalo roam, where the deer and the antelope play."

On Bison Flats, and to the north near the intersection of Highways 385 and 87,you'll see two major towns of prairie dogs. You'll hear the dogs' bark-like calls. And if you're like thousands of other visitors, you'll spend some time watching the activity. Along about dusk, it's not uncommon to see a coyote come loping across the flatlands, in search of an errant prairie dog.

The park also has about 350 elk, but you'll find they're not as easy to see as the other animals. Your chances are best at dawn or dusk. Whether or not you see them, you may want to join those who visit the park in September or October just to hear the bull elk bugle.

There's much more to the park than you can easily see in a day's time. From mid-May to mid-September, people can stay overnight at Elk Mountain

campground near the park headquarters. The campsites are set along the mountain ridges in the pines. A nature trail provides a self-guiding walk, and, in the summer, campfire talks and programs are held in the amphitheater. One night you might hear a talk about the park's animal management policies or its wildflowers, and another night you might be treated to a park guide playing a banjo and singing Black Hills folksongs.

The campground is surrounded by an inobstrusive fence to keep out the bison, but on a summer night it's not uncommon to hear them snorting and bellowing as they wallow in a nearby dust hole on the hillside prairie. Late at night, as things quiet down, it's likely you'll also hear the lonesome howl of coyotes. And in the evenings and early mornings, campers occasionally are treated to a visit by a mule deer as it wanders through the center of the campground foraging on the summer greenery.

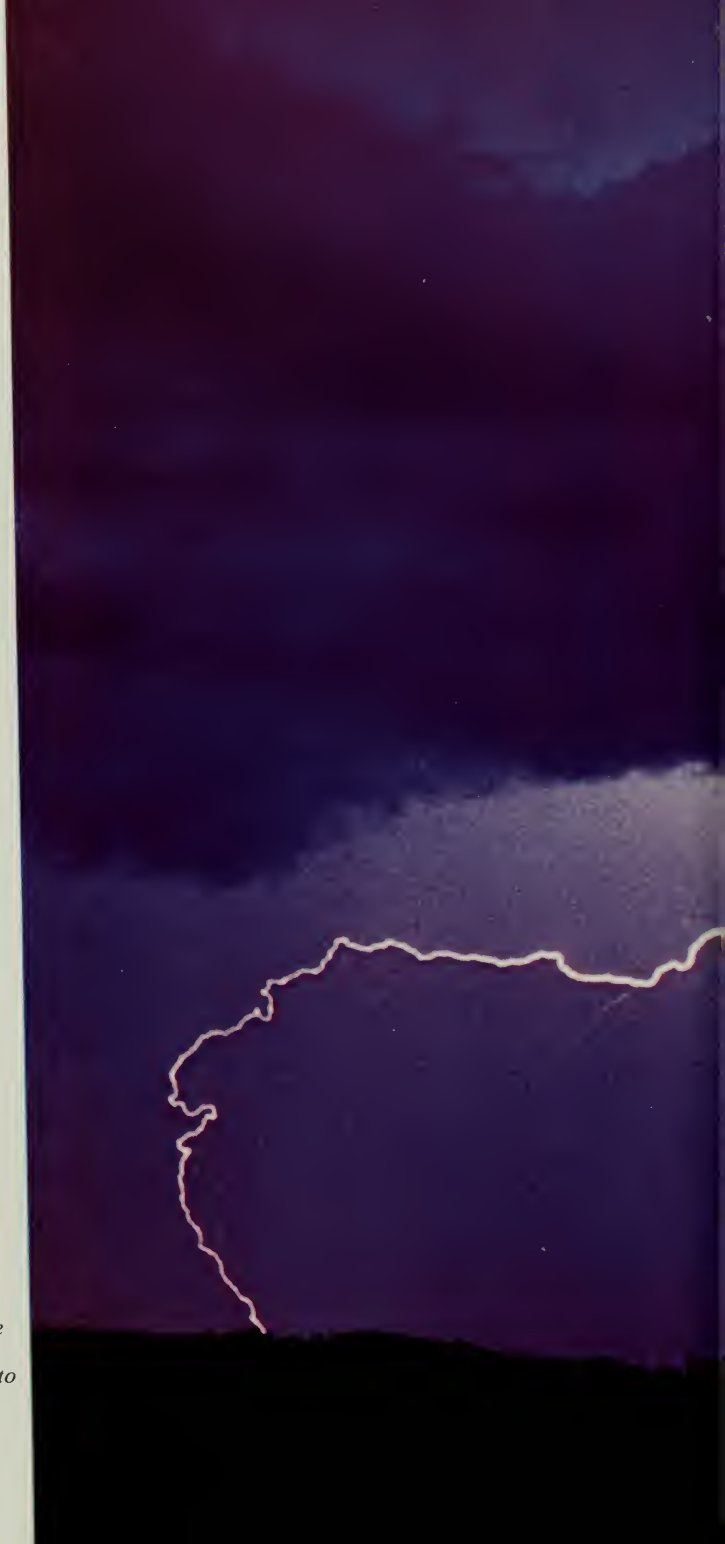
You'll find that the campground is a convenient place to stay while making trips to the north to Custer State Park, the picturesque Needles Highway, and stately Mount Rushmore. The campground is not as crowded as those in the hills to the north.

In the spring, parts of your campsite may be carpeted with the pinks and purples of the southern shootingstar. A bit later, you'll see the yellows of the prairie coneflower and common pricklypear cactus. In July, the purples of the pale purple coneflower and three-nerve fleabane are common sights.

At park headquarters, you can buy a checklist of wildlife and a calendar that will give you the seasons in which to look for certain types of flowers, birds, other animals, and snakes. Yes, there are prairie rattlesnakes in the park, so you should be careful, though they generally won't strike unless provoked.

Bird watchers love the park. In Elk Mountain campground, you may have a gray jay visit your picnic table at breakfast time. Chipping sparrows may fly in and eat at your feet. The flycatchers will put on an aerial display from adjoining trees, and you'll hear the calls of the pine siskins as they work their way through the surrounding forest.

Hikers will find high roads and low roads for their delight. There's a self-guiding trail up Rankin Ridge in the north part of the park, or a leisurely walk down a fire road in Beaver Creek Canyon, for ex-



Thunder and lightning storms frequent the Black Hills in the summer. These natural sound and light shows add a bit of drama to life in the park, especially for those camping and hiking.

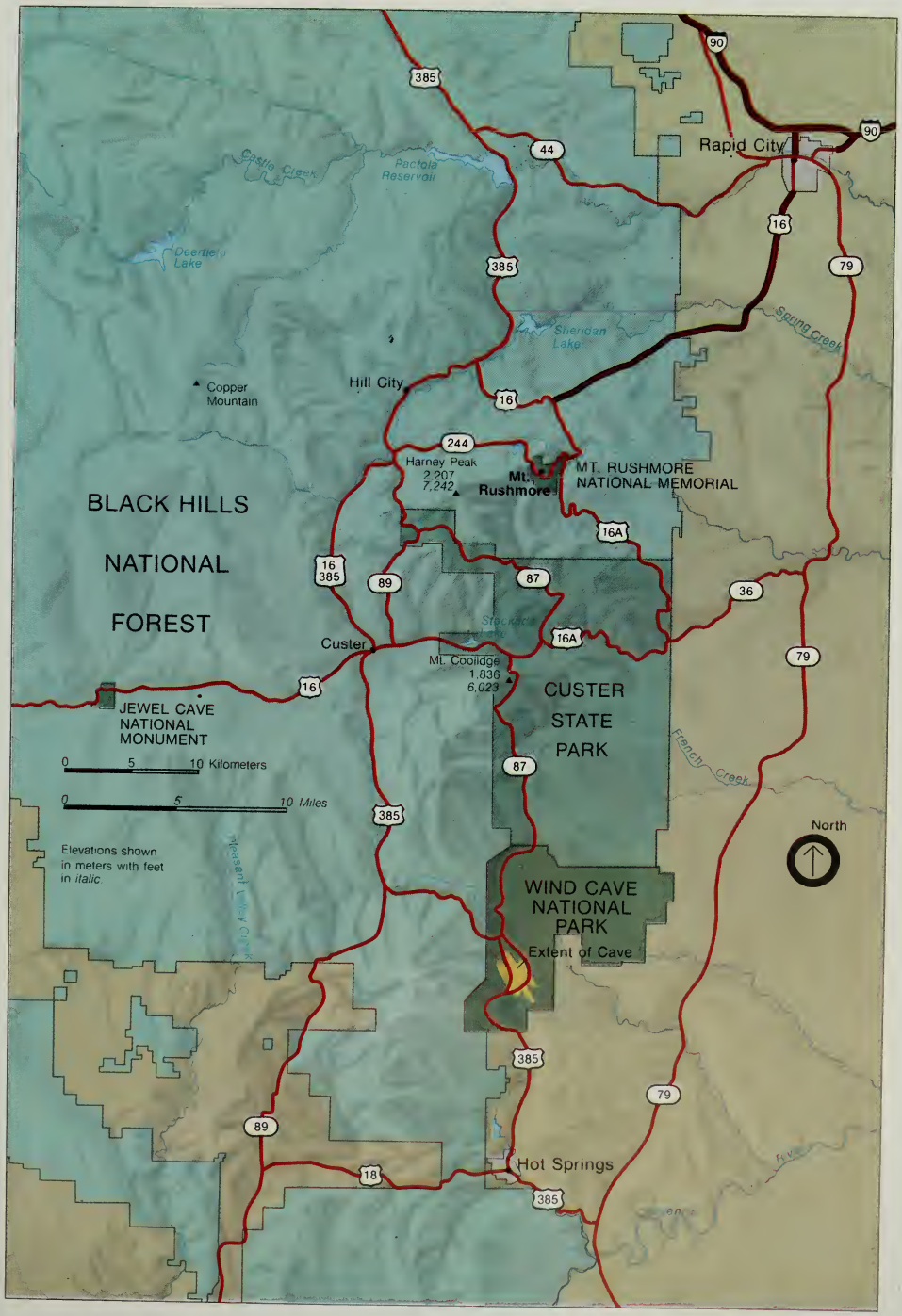
ample. In Beaver Creek Canyon, you may be treated in springtime to the spectacular colors of western tanagers, or you may see a prairie falcon nesting high on the face of a cliff.

But you won't have to leave the main roads to see the bird life. If you're lucky, you may spot a golden eagle sitting atop a pine in the summertime, and in the fall and winter, bald eagles are common. Then there's that black and white bird with the long tail that many tourists ask about: that's a magpie.

If you stay in the Wind Cave area for more than a day or so, you'll remember the weather. The fall is generally warm and pleasant. The winter is primarily moderate, but everyone keeps a wary eye out for big snowstorms. The spring is short, cold, and wet. The summers are hot and often dry, but the nights are relatively cool. Frequently, in the late afternoons, the thunderheads begin building, the wind picks up in the ponderosas, and all of a sudden you are caught in a downpour. The thunder resounds through the hills, and the lightning makes you wish you were somewhere at the bottom of the cave. Occasional hail accompanies the storms. Often, the storms are gone just as quickly as they came, and you are treated to the artistry of fading sunlight playing on the water drops on the limbs and needles of the pines. And, the scent of a pine forest after a rain is pure freshness. To smell it is worth waiting out a storm.

No matter what the season, enjoy the park–and use this book to heighten that pleasure. Delve into both of them. Perhaps you, like others over the years, will come to revere this land where the wind blows beneath as well as above the ground.

Wind Cave's location makes the park a good headquarters for sightseeing in the Black Hills. Adjacent to the park is Custer State Park, and nearby are Jewel Cave National Monument, and Mount Rushmore National Memorial. In Rapid City, the museum of geology at the South Dakota School of Mines has some fine specimens of formations from Wind Cave. For practical information on the Black Hills area, on camping facilities, and on caving, turn to the Guide and Adviser section starting on page 122.



Rapid City
Castle Creek
Pactola Reservoir
Deerfield Lake
Sheridan Lake
Spring Creek
Copper Mountain
Hill City
Harney Peak
2,207
7,242
Mt. Rushmore
MT. RUSHMORE NATIONAL MEMORIAL
BLACK HILLS NATIONAL FOREST
Custer
Mt. Coolidge
1,836
6,023
CUSTER STATE PARK
JEWEL CAVE NATIONAL MONUMENT
0 5 10 Kilometers
0 5 10 Miles
Elevations shown in meters with feet in italic
French Creek
North
WIND CAVE NATIONAL PARK
Extent of Cave
Hot Springs
385
44
90
16
79
244
16A
89
87
36
18

The Attic
Stabler Pass
Mound Builders Rest
Pearly Gates
Fairgrounds
Frostwork Ledge
Three-way Stair
Monte Cristo's Dungeon
Monte Cristo's Palace
Snowdrift Avenue
The Amphitheater
Standing Rock Chamber
Blue Grotto
Trail
Elks Room
Elevator Building
Bat Scratches
Overland
Brown Canyon
Temple Room
Backroom
Crossroads
Methodist Church
Milton's Study
Monument Hall
Lower Landing
Beacon Street
Columbian Hall
Post Office
Camel's Back
TRAIL
Rome
North Room
Roe's Misery
Devil's Lookout
Upper Specimen Route
TRAIL
Visitor Center
Bat Alley
Cave Entrance
Rainbow Falls
Omnibus Hall
Wind Tunnel
Guide's Discovery
Frostline
Egg Hatchery
Nudist Colony
Padded Cell
Bayberry Candle Room
Disappointment Chamber
Nuthouse
Boxwork Chim
Crystal River
Club Room
Christmas Tree Park
W. S. Survey
Highest Point in Cave
1,269 Meters
4,161 Feet
Chimera Room
Pallette Room
Half Mile H
Figure Eight Room
Half Mile Hall

Only with a map can you readily sense the extensiveness of Wind Cave. Use this map as a reference when taking a cave tour and while reading about the early explorations starting on page 31.

Worlds Together But Apart

World of Darkness: Early Explorations of the Cave

By Robert D. Woodward

The story of the early explorations of Wind Cave is essentially one of two families, the McDonalds and the Stablers, and of a teen-ager, Alvin McDonald, who kept a diary of those early days. It is a sketchy story, with shreds of information gathered from newspaper accounts, family recollections, and personal interviews–and from Alvin's diary. The story involves no major historical figures, and its scope is more local than national, but it is a fascinating tale.

Perhaps the story intrigues us because its limited scale makes it easy to imagine ourselves or our forebears among the characters. Perhaps the fantasy of being the first to find and explore a cave attracts us. Or perhaps our interest is captured by an 18-year-old boy who kept track of the difficulties and the excitement of those early days in the cave.

Whatever the attraction, this local story has a drama all its own.

The Discovery

The seasons came and went, and in the spring, water roared down a rocky gorge and seeped down a small hole to the cave below. Over the years, the hole enlarged bit by bit–and the wind whistled in and out of the small opening. The Sioux Indians came across the hills and up the ravines, and quite likely one of them found the whistling hole in the ground. The Sioux legends tell of a revered Cave of the Winds, as Wind Cave sometimes was known in the early days. Sitting Bull's nephew, Chief White Bull, once told an interviewer that "the Sioux believed that the Wind Cave in the Black Hills was the cave from which Wakan Tanka, the Great Mystery, sent [the buffalo] out into the Sioux hunting grounds. This was one reason why the Sioux fought so hard for the Black Hills when they were invaded by the whites."

In the darkness of the cave, a lantern illuminates boxwork, a formation which is more predominate here than in any other cave in the world. The latticework of calcite fins is sometimes likened to a brick and mortar wall with the bricks removed.

The Sioux hoped that when they regained the favor of their gods, the buffalo would emerge from Wind Cave and once again fill the plains.

Gold later brought the white man to the Black Hills, and as the pioneers poured into the area in the days of 1876, they combed the land and the ravines. In 1881, one of them "discovered" the opening to Wind Cave. Soon various men claimed to have made the discovery; in later years, most pioneers credited the Bingham brothers, Jesse and Tom.

On a spring day in 1881, the Binghams were hunting deer in the pine-covered hills of Custer County, South Dakota. Jesse wounded a deer and was following it up a ravine when he heard a loud whistling sound coming from the ground. He saw the grass waving, although there was no surface wind. When he and Tom investigated, they found a 20- by 25-centimeter (8- by 10-inch) hole in the rocks. The wind was said to be blowing out of the hole with such a force that it knocked off Jesse's hat.

John Dennis, their half-brother, was hunting with them. They called Dennis and played the hat trick on him. Thus it was that the first white men came to know about Wind Cave.

Later, when the cave was being developed, several others were given fleeting credit for the discovery. One of them was Lame Johnny, a notorious Black Hills character and horse thief. Perhaps seeking to capitalize on his notoriety, the cave's managers said in an early advertising leaflet that Lame Johnny discovered the cave in 1877. One early report said that Lame Johnny, whose real name was Con Donahue, had a treasure trove hidden in a cave in the Wind Cave area. "This notorious outlaw," the report said, "operated single-handed on the old stage line leading north from Buffalo Gap, and it is said that he stole enough gold from the stages leaving the Hills to build a city." On an August evening in 1879, he was hanged by vigilantes.

Lame Johnny's name was linked only a short time with the discovery of the cave, but the creek where he was hanged–east of Wind Cave National Park–still bears his name.

Other persons who occasionally were mentioned as the discoverers of Wind Cave were John Wells of Hot Springs in 1884 and Edward Petty in 1881. Today, most people agree the Bingham brothers

made the discovery, but they disagree on which one. Some say it was Tom, but many oldtimers and early newspaper accounts claim it was Jesse.

Jesse's role may have been played down after he had a brush with the law in 1889. He was charged with cattle stealing and was apprehended by sheriffs from Custer County, South Dakota, and Dawes County, Nebraska. He submitted quietly to arrest but managed to escape. Later he was jailed and his bail of $1,500 was paid by a wealthy cattleman in the Black Hills. He returned to his homestead near Wind Cave, then left, and was last heard from in Canada, where he remained until his death.

A longtime rancher near Wind Cave, Bob McAdam, said years later: ". . . and then Tom, of course, Bingham, he comes in and claimed the Wind Cave afterwards. Oh, that was several years afterward. Everybody says that Jesse did it, but Tom, he begins to claim it. Then another old fellow here, Wells, he claims he discovered it."

"The Infernal Pit"

The Binghams went on with hunting that first day of their discovery in 1881, but later Jesse returned to show some friends the hat trick. To his surprise the wind was blowing into instead of out of the cave. His hat was sucked from his hands, and it disappeared into the hole.

For the Binghams, the wind effect at the cave was merely a curiosity and they apparently did little to hold the land or to explore the cave. Other explorations were reported. In the fall of 1881, Black Hills pioneer Frank Hebert was "talking with Charlie Crary in Custer [and] he told me about a hole in the ground where the wind came out screeching! It had been found by Jesse Bingham about 15 or 20 miles south of Custer. Crary said he had been in there and explored it some and left a ball of twine unstrung along his route. As a party of us were going down in that country after plums, I concluded I would go and investigate it. I found Jesse Bingham, and he told us as near as he could where to find it, but it took us all the next day to locate it. One of the party walking down the gulch heard the wind."

In that early party were Hebert, Jesse Girelle, his wife, two girls, and Mayme Sprague.

"I was supposed to lead," Hebert said. "We had to jump down a hole that I could just about squeeze through, six or seven feet. I started down with my lantern. Had to crawl on hands and knees facing a terrible wind for about fifty feet, and then the main hole seemed to be going down at right angles and very steep, but it gave a good foothold.

"I waited for some time and yelled for the others to come, but the only one who answered me was Mayme Sprague. She said she thought they were coming. I found the twine that Crary left and made my way down. Explored the walls as we went and saw places that were scalloped and looked like post office boxes. We kept on going down and yelled once in a while but got no answer. After we had been there for quite a while I saw an opening off to the right and dropped the string with the intention of exploring that a little. I went in I suppose 30 or 40 feet and saw a hole looking down about five or six feet to the bottom, and then another opening down there."

Hebert said he thought he heard water, so he jumped down to take a look but could find none. "It was a little further than I thought to the top, so I had to make three or four tries to jump up to get a hold and told the girl [Mayme] to catch me . . . and pull," he said. Finally, after much pulling, he made it up.

"We started on back, found the string and followed it. Those on top helped to pull us up. They went down as far as where the main part turned down, but got scared and went back."

Other explorations quite likely were made in the next few years; two, for example, were recorded in 1884. One party consisted of John Wells, who once claimed to be the discoverer of the cave, and at least three other men. They apparently sought to enlarge the cave's entrance by chipping the rock around the opening.

In the late summer of 1884, Charles Stewart, his sister, Kennett Harris and his mother and a young boy went into the cave. They left Hot Springs early in the morning but became lost on the way and did not enter the cave until about 6 p.m. They stayed inside until midnight and arrived back in Hot Springs

at 4 a.m., where they found relatives and townspeople organizing a search party for them.

In July 1886, according to the *Custer Chronicle,* a party of 30 to 40 people from Custer consisting of "Odo Reder and family, C.H. Walker and Family, Miss Parker and others . . . supplied with tents, camping utensils and everything essential to comfort left . . . for the Cave of the Wind on Tuesday, where they remained for a day or two exploring the labyrinthine mazes of that attractive wonder and enjoying the refreshing winds that make that place especially enjoyable when the mercury is seeking the upper levels."

By September 23, 1887, the *Hot Springs Star* was reporting that Wind Cave had been explored for five kilometers (three miles) and "no bottom found. The wind blows a perfect gale from the mouth of the infernal pit."

As more and more visitors came to probe the marvels of "the infernal pit," interest heightened in the area around the cave entrance and several location certificates–claims for the mining rights to the land–were filed. The early ones were abandoned, but by 1890, the South Dakota Mining Co. had established itself in the area, thereby setting the stage for an uproarious decade in the cave's history.

The McDonalds

Jesse D. McDonald, two of his sons, Elmer and Alvin, and his daughter, Mary, arrived in Hot Springs in the fall of 1889 looking for work. The following spring, the elder McDonald was hired as manager of Wind Cave by the South Dakota Mining Co., whose president was John C. Moss. In the next five years, the McDonalds were to play a prominent and often dramatic role in the cave's early development. Led by young Alvin, they explored extensively in the depths of the cave, and in time became entangled in extensive legal controversies and feuding about rightful ownership of the property.

Who were the McDonalds? They hardly seemed the type to have been cave explorers. They were Quakers and apparently a family of little means. The grandfather was a wheelwright who helped keep the

Jesse D. McDonald became manager of Wind Cave in 1890 for the South Dakota Mining Co. Though the company quickly lost interest in the cave because no valuable minerals were found, McDonald saw the cave's tourism potential and stayed on as a homesteader.

Jesse McDonald's sons Elmer, above, and Alvin, right, carried out most of the initial explorations of the cave and guided tourists.

wagons rolling during the 1849 gold rush. Jesse and his wife, Lucy, lived in the farm country of north central Iowa, in Franklin County, and later moved to the small community of Calliope in Sioux County, Iowa, on the Big Sioux River. In 1888, J.D. McDonald, Elmer, and Alvin went to Thermopolis, Wyoming, where they lived for a year before going to the Black Hills. Seven children were born to J.D. and Lucy Anne McDonald–four in Franklin County and three at or near Calliope.

When the older children went west with their father, the younger ones apparently stayed behind with their mother. Little is recorded about the family's relationships at that time, but by the summer of 1894, J.D. McDonald had married Margaret Drinkhahn, who filed on a homestead about one kilometer (one-half mile) from the cave.

Elmer and Alvin were very active in the early development of the cave, and Mary apparently was the first woman guide. Tommy, the next oldest child, eventually spent some time around the cave but never liked it, and Roy did some exploring later. Harry, the youngest, spent at least one summer at the cave.

J.D. McDonald was described in early newspaper accounts as genial, courteous, and good-natured. He made regular trips to Hot Springs and, judging from reports in the *Hot Springs Star,* kept the newspaper informed of progress at the cave. On June 20, 1890, shortly after he took over at Wind Cave, the paper reported: "Mr. J.D. McDonald was at Hot Springs on Monday. Mr. McDonald is located at Wind Cave, a natural curiosity of great beauty, about 10 miles north of Hot Springs. He deposited on our desk an elegant specimen from the cave, and the curiosity excites the wonder and admiration of all visitors at the office. Mr. McDonald informs the Star that a hotel is being erected at the Cave for the accommodation of visitors, and competent guides can be secured by those wishing to make a tour of the cave."

Early photos suggest the landscape around the cave was not too different from today–stands of ponderosa pine, open grasslands, rocky hillsides, and ravines. When the McDonalds arrived, at least two wooden buildings were standing–a house built by a man who had previously lived on the property and an old blacksmith shop. Writing years later, Elmer's

In this early postcard view, a group lines up as it prepares to enter the cave through the small log building.

wife, Emma, said J.D. McDonald and the two sons ". . . located in the old blacksmith shop with a view of prospecting gold. A small log house was erected over the opening and some little work done toward an entrance to the cave. No minerals were found. The McDonalds had to furnish their own supplies. Mr. Moss [of the South Dakota Mining Co.] finally discharging J.D. McDonald as agent.

"J.D. McDonald then changed the entrance a little, built a larger log house over the new opening and settled on the land as a 'squatter.' Work was going steadily forward in opening up the cave, new rooms were discovered and opened up by blasting through intervening rock walls . . . much exploring was done. Elmer and Alvah McDonald (at that time aged 20 and 18) would take balls of twine, fasten one end on a snag near the main route and steer off in a side opening and go, and crawl, as far as they could or as far as the twine lasted, then turn back marking the route. . . ."

Cave visitors today travel down cement stairways and well-lighted and defined pathways, yet they are touched by the awesomeness of the cave and intrigued by the many byways. Imagine those early trips into the depths, often with only balls of twine and candles to show the way. In August 1890, a party of Hot Springs people and a reporter for the *Hot Springs Star* were taken into the cave by J.D. McDonald. The reporter later wrote what appears to be the first detailed newspaper account of a visit to the cave. The story–headlined "Down 2000 Feet Below the Earth's Surface and Two Miles From Any Way of Exit!"–suggests the McDonalds had already done some extensive development work, for ladders and ropes were in place and a fairly lengthy cave trek was charted, with a number of sites named.

"After being plentifully supplied with candles, we made our way down the stairway against the very strong wind and then began our descent proper, into the wonderful, indescribably wonderful cave–down, down into the very 'bowels of the earth.' We climbed down two strong perpendicular ladders for 125 feet. Then began the true novelty of 'cave seeing' . . . passing over some distance, first crawling, then walking, then sliding down narrow chasms, under masses of huge rocks, through dark, deep openings. . . .

"We then sit down and look in blank amazement, almost speechless at the scenes about us. This room is called the 'post office' owing to the formation covering the ceiling and parts of the walls, very much resembling honey comb in structure, which are called boxes. . . . Here our host showed us some autographs of persons who visited this spot about six years ago. The paper on which these autographs had been written was not in the least soiled by dampness or mold, but was as 'good as new.' After we had lingered here for quite awhile, following the example of hundreds of other visitors by autographing in a large book, we passed out, deeper and deeper, over precipices and through chasms.

". . . We find we must force our way for several feet on the rough, rocky bottom, head first, laying all the while on our sides, using our hands above our heads as propellers, through a long and very narrow dark chasm. Here, we are told, about six years ago, a young man of medium stature by the name of Charles Rhole [Roe], attempted to force himself through but became fastened between the walls, and his companions were obliged to pull him out by tying a rope to his feet." Today, that spot is known as Roe's Misery. There and in several other tight passageways, park visitors sometimes wonder if they'll find themselves in Roe's predicament.

From Roe's Misery, the 1890 group moved on, passing later over the "Devil's Track, where we had to grope our way for several feet under very trying circumstances. Our guide here called our attention to a dark, narrow chasm about us, the top of which, he said, had never been seen. Throwing our lights as far as possible up the narrow crevice, we tried in vain to see the top."

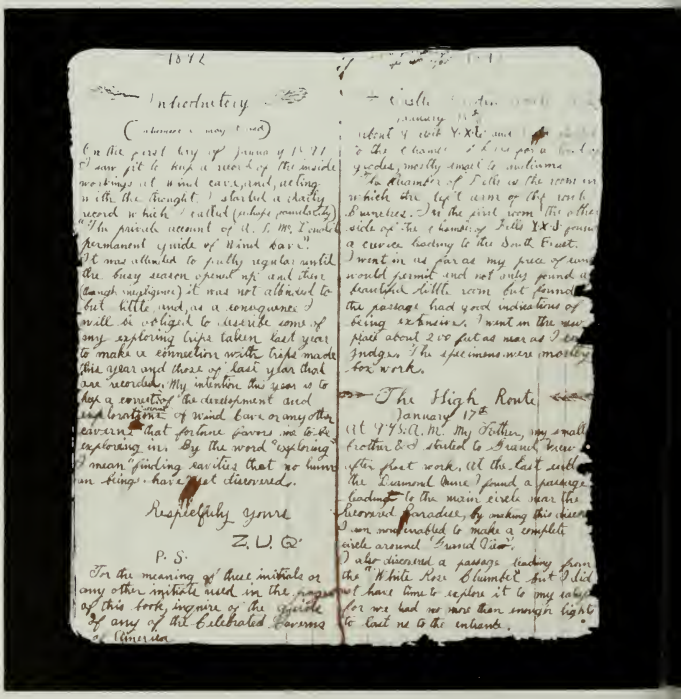
They next came to a point where they had to slide down a rope for 35 meters (115 feet): "One at a time we passed down in the dark deep depths below, grasping the rope for our lives, now touching our toes to the wall for a little rest, now swinging clear from everything, until at last we were rewarded by arriving safe and sound at the bottom–of the cave? No, for the bottom of the cave has never been found."

This account captured the flavor of the early days and quite likely generated interest among outsiders to see the cave.

Alvin McDonald's Diary

Alvin McDonald was not quite 18 when he started recording his cave explorations in a diary, and not until a year later did he explain why he was keeping the record.

"On the first day of January 1891, I saw fit to keep a record of the inside workings of Wind Cave, and, acting with the thought, I started a daily record which I called (perhaps familiarly) 'The Private Account of A.F. McDonald, Permanent Guide of Wind Cave.' It was attended to pretty regular until (through negligence) it was not attended to but little, and as a consequence I will be obliged to describe some of any exploring trips taken last year to make a connection with trips made this year and those of last year that are recorded. My intention

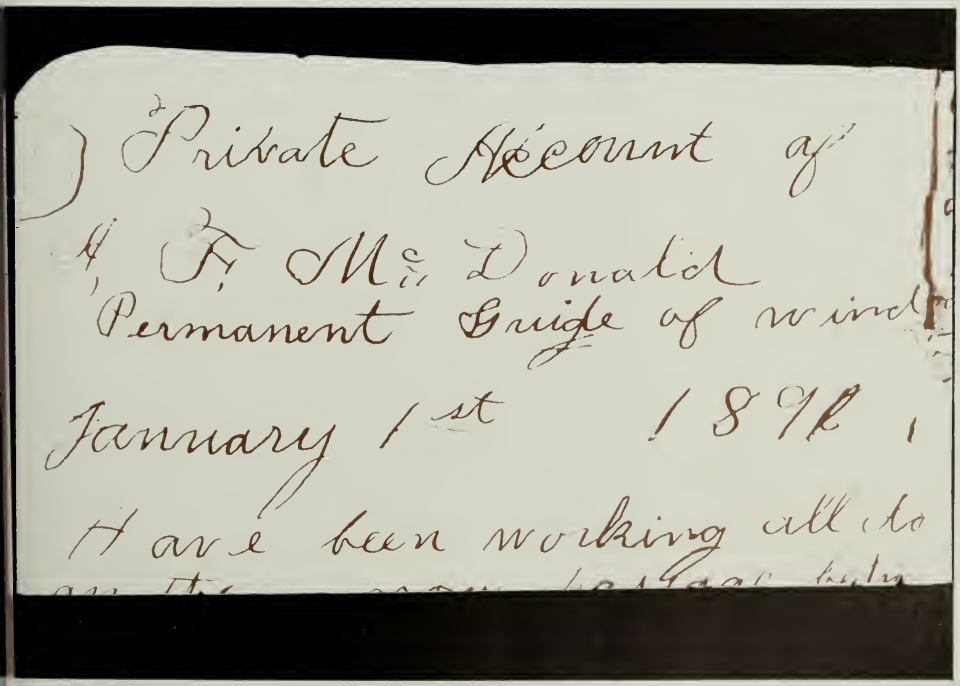


In January 1891 Alvin McDonald began his Wind Cave diary, which he described a year later as "a correct account of the development and explorations." Note his "Z.U.Q." sobriquet.

this year is to keep a correct account of the development and explorations of Wind Cave or any other caverns that fortune favors me to be exploring in. By the word 'exploring' I mean finding cavities that no human beings have yet discovered. Respectfully yours, Z.U.Q."

In a postscript, he added: "For the meaning of these initials or any other initials used in the pages of this book, inquire of the guide of any of the Celebrated Caverns of America." The initials Z.U.Q. and others that Alvin used in his diary, Y.K.J., have never been satisfactorily explained, except that they were said to represent Alvin and Elmer respectively.

Keeping diaries apparently was a family trait. A descendant said that Alvin's father, J.D. McDonald, kept them regularly in later years, and Harry, the youngest son, did too. It's possible J.D. had a diary during the cave years, but no such records have turned up. Alvin's account, as he suggests, is spotty


Private Account of
A. F. McDonald
Permanent Guide of Wind
January 1st 1892.
Have been working all do

in places, but for two and a half years he kept writing–and today the diary stands as a remarkable record of the early explorations of the cave.

In the winter months of 1891, the McDonalds were busy preparing the cave for the first extensive summer visiting season. They also were taking occasional visitors into the cave; the first seven days of Alvin's diary in January, for example, mention nine visitors.

On Sunday, January 4, Alvin noted: "It has been a dull day today. With no visitors except J.C. West, Will Jones and Boone Willard, I and Elmer took a trip in the cave at 7:15 p.m. and got out at 11:30 p.m. We discovered a lot of Black Diamond work on the Snow Ball route to the right of the Camel's Back and a good bit of Box Work South East of the Fair Maids pathway. I brought a big piece of Black Diamond work and will most likely keep it as it [is] hard to get any more like it in size or shape."

Alvin appeared to be making the most exploring and excavating trips, but his brother, Elmer, and his father also were blasting along the routes. They also were building up their private collections of specimens, as Alvin's diary entry for January 5 indicates:

". . . I and Elmer started in the cave at 5:15 p.m. and returned to the entrance at 9:31 p.m. We put a shot in a small hole in the snowball route and after getting through, I found a beautiful purple crystal. After bringing two pieces of it out, I traded [the] heaviest one to Mary [his sister] for a strange fossil that father brought out and gave to her that was worth a good deal more to me than the crystal. The fossil goes into my private collection."

Besides collecting, family members also were selling and giving away specimens at the cave and in Hot Springs. On Wednesday, January 14, Alvin "started to Hot Springs about 10:30 a.m. [with] Mrs. Brown's specimens . . . and took $3.00 worth to Mr. Sidey, the specimen dealer in Hot Springs. He paid me two dollars and promised me the rest. . . ." Sidey apparently placed an additional order, for a few days later, Alvin set aside "six geodes to fill John F. Sidey's order of the 16th."

Intrigued by new finds nearly every day and perhaps fueled by a boyish imagination for the unknown, Alvin was spending long, arduous hours in

the cave. In January, he recorded 27 trips into the cave. In February he began logging the time spent as well as the number of trips; he went in the cave 33 times for 119 hours and 45 minutes that month. In March he recorded 35 trips for a total of 134 hours and 30 minutes.

Even in the early days, he showed an appreciation of the magnitude of the task. On Friday, January 23, he took visitors on a 9-hour and 15-minute trip, noting at the end of the day: "Have given up the idea of finding the end of Wind Cave."

While Alvin was exploring and working in the cave, his father was traveling regularly to Hot Springs, apparently in part to promote interest in the cave. The newspaper in the early 1890s records at least weekly visits from J.D. McDonald, who often showed up with the latest specimens or accounts of new findings of rooms or corridors in the cave.

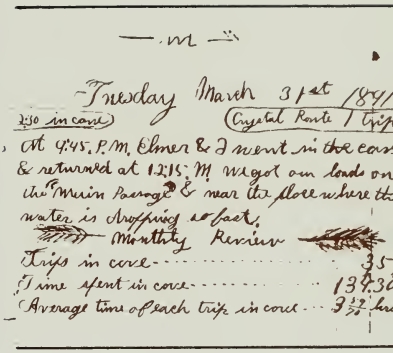
In a typical report in mid-February 1891, the paper said McDonald ". . . brought with him a sample of gypsum marble, a vein of which he has just discovered about five miles underground. The specimen is the very finest of the kind we ever saw. It is fine-grained and takes a high polish. The stone is a regular beauty and will be of immense value, when a way is found of getting it out. The Wind Cave is proving a mine of value, and new discoveries are made almost daily. As one of the wonders of the Black Hills, no visitors should miss seeing it."

The McDonalds were reported to "have been working all winter and now have the ways open and ladders fixed down to Roe's Misery, where they are now working making a way so that visitors need not crawl sideways past this place. By spring everything will be in readiness for visitors. . . ."

Today visitors to lesser-traveled areas of the cave will find string or twine left behind by the McDonalds and other later explorers; the strings are often remarkably preserved and sometimes there are several in a single passageway.

The twine, of course, was a necessity whenever the McDonalds ventured off a known route; it showed them the way back–and gave them a way to judge the distance of their travels.

On their explorations, they always took cotton wrapping twine or brown binding twine and candles. Depending on the nature of their trips, they


Tuesday March 31st 1891
2:30 in cave
(Crystal Route 1 trip)
At 9:45 P.M. Elmer & I went in the cave
& returned at 12:15 M we got our loads on
the "Main Passage" & near the place where the
water is dropping so fast.
Monthly Review
Trips in cave 35
Time spent in cave 134.30
Average time of each trip in cave ... 3 37/70 hr

Alvin kept a monthly log of the trips and the time he and his brother Elmer spent in the cave.

might also take along ropes, a chisel, sledge hammers, and blasting powder.

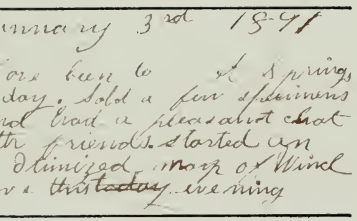
The candles were placed in cut-out tin cans that reflected the light onto the cave's passageways. Occasionally Alvin also gauged the length of his trip by candlepower; on February 1, he noted: "Took a one-candle trip into the cave this afternoon."

Alvin's diary entries were usually short, but his longer descriptions capture the excitement and challenge the McDonalds must have felt as they opened new areas. On February 11, Alvin and a friend from Hot Springs, J.M. Moore, spent nearly six hours in the cave exploring passageways on the way to Monument Hall:

". . . I left J.M. Moore at the top of the crevice & started down it . . . when I got about halfway down I met with a bothersome obstacle in the shape of a rock. After hammering it out of the way, I called for the rope (because there was a hole below me that I could not see the bottom of) and got it in about a minute. I was surprised to find that the rope would not reach within ten feet of the bottom of the hole, and that was the hardest climbing of the whole business. . . . I found myself in a wonderful place & among the most beautiful scenery in the volcanic part of Wind Cave. From here I found the most dangerous climbing that I ever experienced. In the first place, I got into the middle of (as far as I could tell) a place that I could see neither bottom nor top. After I got out of that scrape I found a room about the shape of Monument Hall and about twice as long. At the far end of this room I saw some beautiful bracket work that was crystallized. After I left this room about 400 feet behind, I came suddenly & unexpectedly to a stop. On the way back I saw the main passageway that I had missed but had not the time to explore it because J.M. Moore was getting anxious about me. I found it a good deal harder climbing to get back than I had first supposed. . . ."

A week later, Alvin was back in the cave again with Moore, this time on what he called the Specimen Route. In one large room, they found "passages leading in every possible direction from it. We took a large passage in the South West corner of the room. The passage kept getting smaller and then opened up into a small stalactite room with dirt floor and

red formation, in general. From there J.M. Moore found a passage leading to left & started to explore it for water formation, leaving me to explore another place in a different direction. In about 10 minutes, J.M. Moore called me to come where he was. I started towards him. But got into a hole so tight that I had a hard time getting through, but secceeded after tearing a button of my jacket & found myself into a small stalactite room. From there we crawled into a passage to the left, that kept larger until we got into a room about 12 x 12 feet with 3 or 4 passages leading from it in different directions. I climbed up a hole to the left of the room to the hight of 55 feet but found nothing except a little water formation and a good deal of hard climbing. When I got back to where I left J.M. Moore he was not there, but I heard him calling to me to come to him & bring the string, for he had found a place where we would never stop going down when we once got started. When I got to where I could see him he was about 12 feet below & I had to jump about half that distance but found a soft lighting place. I found myself into a room that was nearly round and about 50 feet in diameter & had a white roof, brown sides and red floor. From there we saw new passages leading in every direction. Our first ball of twine ran out on us in this room & while I was tying the second ball of string to the end of the first, J.M. Moore went on an exploring trip by himself, but not out of hearing. . . . We then stretched the string about 100 feet down the avenue to the east & came to a branch in the passage. Leaving the string at the junction of the passage J.M. Moore took the left and I took the right passage promising not to get out of hearing . . . . After I went about 25 feet I told J.M. Moore to stay where he was until I got back. I went a short distance and turned to the right, coming unexpectedly on the small stalactites that J.M. Moore found a few minutes before. I then returned to the string & we went down into a room that we named 'Turtle Room.' From there we kept on down to the left until we came into a room that we could not see any out of except the way we came in. We finally found a hole that we could get down, by breaking a few rocks out of the way. After I broke the rocks out of the hole J.M. Moore went down about 10 feet and found the hole again filled with loose rock. . . .


nnary 3rd 1891
ore been to H Springs
day. Sold a few specimens
nd had a pleasant chat
th friends. Started an
dimized map of Wind
v. this today evening

Alvin, in a note about one of his trips to the nearby town of Hot Springs, tells of selling cave specimens.

We started out but found a hole to the left that led down. Breaking our way for about 4 feet we climbed down about 20 feet and then had to break out a few more stones. After getting the stones out of our way, we climbed down about 40 feet more & found the passages blocked up again (so tight that we could not break it out with the hammer), so we returned to the 'Turtle Room' & found a passage leading down from there.

"We went down about 60 feet all told & had to break out 2 holes to get through. We then returned to the room that our first ball of twine ran out in and found a large passage leading to the right (as we go in) but left it for future exploration, as had but a little candles and not any string. Elmer was at home when we got out of the cave (8:05 p.m.)."

So it was that the explorations went day after day that winter, except for a few days in later February when Alvin wasn't feeling too well and stayed out of the cave for two days. "Am getting homesick," he wrote, "after staying out of the cave so long."

The diary not only tells about the cave but also provides glimpses into what life was like at the McDonald cabin in those days.

They were having trouble making ends meet that first winter. In January, Alvin had to charge "a sack of flour at Aldens [in Hot Springs] this morning because Moss forgot to send us down any money." The Moss family, owners of the South Dakota Mining Co., apparently were providing credit for the McDonalds at various Hot Springs stores in exchange for work at the cave.

Rabbits, the only wild game "in the country at this time in the year," provided a primary fare until late February, when the McDonalds "got a quarter of beef today of Capt. Willard," a neighbor.

The winter chores included feeding the cow in the barn and gathering wood, and Alvin made occasional trips to Hot Springs, sometimes fighting the South Dakota snows to get there. On January 30, he "started to town . . . and found the snow drifted plenty. We got stuck in a snow drift near Johnson's place and had to unhitch and dig the buggy out of the snow. The horse was so tired when I got to town that I thought best to stay all night."

While life on the surface often was dreary, life in the cave was busy and prospering–at least for

Alvin. He began an itemized map of the cave shortly after he started the diary, and he continued to gather specimens so that by mid-April he could report: "I now have 209 different kinds of rock in my geological collection."

But the work of blasting, chiseling, and pounding away with the sledge hammer was not easy. One early job for Alvin and Elmer was literally to break the Camel's Back.

Some of the time at least, the McDonalds used quilts and blankets during the dynamiting to protect the cave. But there are no indications that they declared any of the beautiful formations off-limits for their rock collecting, and latter-day preservationists likely would be upset by the way in which occasional areas of the cave appear to have been stripped.

Alvin occasionally illustrated his diary, in this case with sketches of ponderosa pine.

The diary reports how the two brothers worked off and on in the Camel's Back area for several weeks. "Elmer and I started in the cave at 1 p.m. to blast the Camel's Back. We put in one 4-inch hole but did no good. We then put a 6-in. hole in the middle of the Camel's Back and broke it all to pieces."

Then it was on to Roe's Misery, where they again encountered rough going. On February 5, "Elmer and I started to work on Roe's Misery at 7:00 a.m. We put in one shot with good effect (18-in. hole) and then drilled 18 inches of another hole before coming out. We came out of the cave at 11:30 a.m. At 12:30 p.m. Elmer and I started back to work on Roe's Misery. We finished the hole we started but the blasting shot did no good as we drilled through into a pocket of some kind. We then drilled a hole in the upper left-hand corner (as we go in). I fired the shot and then came out for supper arriving at 5:30 p.m. Elmer brought out a fine quartz crystal that the shot knocked down." They spent nearly 10 hours in the cave that day.

As the spring of 1891 approached, Alvin was spending less time in the cave and more time prospecting on what he described as Lost Cabin Lode on the property of neighbor J.C. West. He first mentioned the work in late January, but in late spring his diary contains almost daily references.

Alvin and Elmer spent most of the early days of June working on the Lost Cabin claim, and activity also was picking up at Wind Cave as more visitors

arrived. Alvin's diary entries were becoming very brief, but one in mid-June suggested things were looking up at the cave: "We took in $21.00 today."

On one of his frequent visits to Hot Springs to drum up interest in the cave, J.D. McDonald reported he had spent more than $1,000 "in the way of widening passages, putting in ladders and otherwise making the cave accessible to visitors." By July, McDonald was identified for the first time in the Hot Springs newspaper as the person "who has the right to the ground wherein is the mouth of the cave of the winds," a right that was to be much disputed in the months and years ahead. McDonald was talking of organizing a "company having for its object the more perfect opening up the cave . . . (and) to light the cave with electricity and make other improvements."

By mid-July, the paper was reporting that the cave "is now claimed to be the largest and deepest cave in the United States. There are more miles of underground passageways than the Mammoth Cave in Kentucky can boast. A free hack from Hot Springs to Wind Cave has just been put on, and all that is lacking to make the Wind Cave a popular resort is a good hotel. Here is a chance for a good investment."

The claims about the length and depth of Wind Cave often were exaggerated. Elmer McDonald used to think the cave might stretch all the way to Yellowstone; others speculated it might link up with another Black Hills National Park System area, Jewel Cave. Its explored area is not nearly as large as Mammoth Cave: today, Mammoth Cave stretches for about 320 kilometers (200 miles) while Wind Cave has been explored for about 49 kilometers (30.5 miles).

The Stablers Arrive on the Scene

There seems little doubt that talk of the cave's potential stirred the interest of promotion-minded John Stabler, who in 1891 had just arrived in the southern Black Hills and had taken over management of the Hotel Parrott in Hot Springs. That summer Stabler visited Wind Cave for the first time, and

according to his daughter Katie's recollections, became very much interested in it and saw great possibilities for development.

The cave, she wrote many years later, was "occupied by Mr. McDonald (a squatter) who had been sent by Mr. Folsom, head of a mining company, to do the assessment work of the cave. He jumped the claim and took it as a homestead. This was unknown to my father at the time or he would not have bought into the cave. McDonald's family were starving and very hardup and was very anxious for someone to invest money in the development of the cave. He sold Papa one-half interest and we sent out wagon loads of food several times."

Katie's description of the McDonald family's circumstances is indicative of the hard feelings that were to develop between the two families. The simple question of what interest John Stabler actually bought was a major point in the dispute over the years. Although Katie said he bought a half-interest, the McDonalds said otherwise.

Elmer McDonald's wife, Emma, wrote years later: "J.D. McDonald, under the anxious solicitations of John Stabler . . . sold to said John Stabler, for a few hundred dollars, mostly in trade ([daughter] Irene's organ is one item), one-third interest in the income that would accrue from fees paid by visitors for guides, candles, use of overalls and caps, etc.; said John Stabler and his two sons, George and Charlie Stabler, to put their time in at the cave as Guides to help with the work of further exploring and opening up the cave, or chambers in the cave. He also gave the Stablers the privilege of running a hotel at the cave; they to furnish everything and receiving all profit from said hotel.

"The smooth tongue of John Stabler also induced J.D. McDonald to turn over all books and collections to George Stabler. Between them they did most of the business, incidentally transferring most of the coins to their own pockets, besides carrying out enormous quantities of specimens. . . . J.D. McDonald was owner and manager but nominal manager only. John Stabler was soliciting agent–met tourists at Hot Springs."

Whatever the truth of the matter of the original partnership, the McDonalds and the Stablers were joined in a common venture of exploring and devel-

oping the cave and promoting it across the country.

Who was this newly arrived man on the scene? "Honest John" Stabler–as he came to be known in Hot Springs–was a congenial man, and indeed, from all indications was a glad-handed promoter who well recognized the value of publicity in attracting visitors to the cave. His daughter told this story of Stabler's encounter with presidential candidate and renowned orator William Jennings Bryan: "In speaking to Billie Bryan, Papa once said, 'I wish I might talk like you.' Billie Bryan answered 'I wish I might laugh like you.' "

Stabler, according to his daughter, was one of five children, "born of George and Margret Stabler in a part log house near a mill pond near Mifflin, Juniata Co. Penna. in 1847. His father owned a blacksmith shop. He died when Papa [John Stabler], the youngest of the five, was quite young. His mother married Jake Meintzer and moved near Broadhead, Wisc. When Papa was 16, he ran away from home and joined the . . . Wisc. cavalry. He was wounded at Chattanooga, Tenn., and discharged at the end of the Civil War.

"He met my mother, Lydia Raymer, daughter of a very religious family, of Rock City, Ill. They were married and had six children . . . three brothers older and two sisters younger [than me]."

In 1871, the Stablers and their three sons moved west in a covered wagon to land near Middle Creek, Nebraska. "Those were the dry years, and grasshoppers came in clouds, lay their eggs in the ground and rise up in a cloud flying to fresh fields. . . . [The family] lived on barley coffee which Mother roasted, game that Papa shot and a very few groceries. Our folks back east sent . . . barrels of clothes, bedding, nuts and necessities. Papa was a carpenter, walking five miles each way for $1 per day. Mother was a tailoress and made clothes for people. She also pieced a quilt of calico, some material from the Civil War days."

Raymer, the youngest son, died in the summer of 1873, and on October 29, Catherine (Katie) was born. She was to be a key figure at Wind Cave in later years.

John Stabler moved his family again in 1874, this time to Hastings, Nebraska, where he went into a partnership in an implement business. The country

"was new and crops good, lots of machinery was needed, so they made good." The two younger Stabler daughters, Minnie and Edith, were born at Hastings. In the fall of 1879, the Stablers moved to Lincoln, Nebraska, where the father started "to make machinery in the prison with convict help." But unlike the earlier years in Hastings, "Papa's business here was not a success as the convict help was not satisfactory and also the bank where Papa had his money broke." The family bought a home in East Lincoln, and "Papa went on the road selling machinery. He made good but wanted a business of his own . . . the next fall [1889] . . . we moved to Chamberlain, S.D., and ran a hotel, The Brule."

But business soon dropped off there, and Stabler sent his younger son, Charles, with a party to Hot Springs "to look up a location. He found the Hotel Parrott on the right side of the Court House almost finished and rented it. Papa packed our furniture in two freight cars and shipped them to Hot Springs. Then he bought a covered wagon, team of horses and equipment, found another family . . . to share the trip" and they were on the way. So it was that the Stabler family arrived in the Wind Cave area.

Exploring and Touring

The summer of 1891 was a turning point in the cave's history. The cave was still under the control of the South Dakota Mining Co., but the McDonalds and Stablers were running the place as if it were their own. Disputes about the rightful ownership were several years ahead, but the seeds of discontent were being sown as the exploratory and development work continued–and as more and more visitors plunked down their dollars for tours and specimens from the cave.

Judging from Alvin's diary, the exploration and naming of areas of the cave was reaching a hectic pace:

"On the 3rd day of July 1891, Lottie's Pride, Crown Chamber, Saint Peter's Dome, Art Gallery, Sculptor's Dream, Council Chamber, Saint Dominic Chamber, Stabler Pass, Artist's Ideal, Vestibule, Union College, Chamber D'Norcutt, Centennial Gal-

lery, Blue Grotto, Perilous Pit, Crown Chamber Circle, Star Chamber Circle and Art Gallery Circle were discovered by M.E. Crookham, Willie Crookham, Geo. W. Lee and A.F. McDonald. . . .

"On the fourth day of July 1891, the Omaha Bee Office, first and second rooms of Lakeside Scenery, Cathedral, Piano, Silent Lake, Royal Pilasters, Tobbogan Slide, Washington Boulevard, Luray Dome, Imperial Dome, Nebraska Dome, Cupula, Luray Cavern and Lincoln Falls were discovered" by the same four explorers.

The reference to Stabler Pass on July 3, incidentally, was the first time Alvin's diary acknowledged the presence of the Stablers at Wind Cave. But beginning in March 1892, the diary documents the Stablers' growing influence. George Stabler became an exploring companion with Alvin, and the diary of March 20, 1892, notes how George, Alvin, Elmer, and J.D. McDonald made a major discovery of the cavernous Fairgrounds:

"George A. Stabler named the room the 'Fair Grounds' and the name is very appropriate for the floor is unusually level and it contains nearly every kind of specimens that are found in the cave." Alvin's diary included a small drawing of the shape of the Fairgrounds and noted that the men had inscribed their names at the discovery site.

By mid-summer of 1891, visiting parties of 8 to 10 persons a day were not unusual. Visitors rode the stage from Hot Springs and sometimes ate dinner before entering the cave. A reporter for the Hot Springs paper noted that ". . . an immense amount of work has been done in enlarging some of the passages, thereby making the trip through the cave easier. In its present condition ladies can make the exploration of the cave easily, although it by no means resembles a walk over smooth pavement yet; but compared with the toil and danger attendant upon the trip originally, it is now excellent." The visitors ". . . took dinner before starting. The ladies donned trousers and blouse, and each armed himself with a candle. The guide, Mr. J.D. McDonald himself, took a supply of candles sufficient to stand a trip of a dozen hours."

The account indicated that each name of an area in the cave had a story about its derivation. The Church Steeple, for example, was so-called because

"of its resemblance to the spiral shape of a church steeple and also that when the room was christened, a rock projected from one side, [which] when struck by some hard substance, would give a clear bell-like sound very similar to that of a church bell."

Elmer McDonald, one of the main guides in those days, used to liken the cave to a sponge. "Take for instance a sponge as large as an apple barrel and there would be holes in it as big as a man's thumb and closed hand," he said. "Now take a sponge four miles square and 500 feet deep with holes in proportion to the little sponge, and you have an illustration of The Wonderful Wind Cave. . . ."

In December 1891, the largest group yet to visit the cave, 31 people from Black Hills College in Hot Springs, descended to the Methodist Church area where the "party held religious services, consisting of singing hymns, prayer and a short speech by Pres. Hancher [of the college]. This is the first time that religious services have been held in Wind Cave. About this time, when Pres. Hancher went to discover the Methodist Bell, to ring it for the services, his foot slipped, and he was nearly precipitated into a yawning gulf below. . . ."

Bumps and bruises there were along the way, and occasionally a lost person or two. One night three people became separated from Alvin. The next day he found one in one place and two in another.

A tallyho stagecoach, owned and driven by Chris Jensen, stops in front of the Wind Cave Hotel in the 1890s. The roundtrip cost 75 cents.

A Petrified Man, a Hidden Pin

The cave's popularity was growing. J.D. McDonald made trips to Iowa to display specimens at two expositions. Newspaper reports glowed over the cave's grandeur. John Stabler no doubt talked up the cave to visitors at his Hotel Parrott in Hot Springs. His son, George, opened the Wind Cave Hotel in the summer of 1892, and the *Hot Springs Star* reported in August "that more people are going from here to Wind Cave, at the present time, than at any time since its discovery. It is a wonderful curiosity and no one should come to Hot Springs and go away without seeing it."

But if enough people weren't seeing the cave or hearing about it afar, things were going to change. In 1892, a so-called petrified man was found near Wind Cave and promptly put on display; news of this "curiosity" circulated around the Midwest. And in 1893, Prof. Paul Alexander Johnstone, described as a "world renowned mind reader," ventured blindfolded into the depths of Wind Cave in a three-day search for a hidden pin; later that year Alvin and his father promoted the cave at the World's Fair in Chicago. The latter two events generated varying degrees of national attention.

Petrified men were popping up around the country those days, and many were just as quickly being decried as hoaxes, but the *Hot Springs Weekly Star* of July 15, 1892, would have it otherwise: "When it was reported a few days ago that a petrified man had been found out near Wind Cave, people smiled and called it a fake to draw crowds to the cave. But there's no fake to it. They have the most wonderful piece of petrifaction out at the cave, where it is on exhibition at 25 cents. . . . The Star went out Tuesday night to view what many were free to term a 'Cardiff giant fake.' We were fully repaid for the trip, for it is a curious sight to see a petrified human being. The form is perfect in every way, and one feels, when viewing it, that they are in the presence of a corpse. The features are all perfect and distinct, even the eyebrows being plainly discernible. The fingernails, and in fact everything about it, is as natural as though it had been buried but a day. The

color is of a dark yellow, and one might at first be suspicious that it had been moulded from clay, as in color it somewhat resembles a burned brick, but upon examination one is forced to believe that it is the true petrifaction of a human being. Three or four physicians have examined the form and pronounce it a genuine petrifaction of humanity. . . ."

The petrified man was displayed at the cave for about a month, then taken to Hot Springs where it was shown in a tent under the direction of John Stabler. Later Stabler and a Mr. Bronte took the petrified man on the road, showing it in Nebraska and Kansas. They apparently sold out their interests, and McDonald's, in Topeka.

Elmer McDonald's wife said the Stablers had initiated the "petrified man" show; she called it a hoax.

The petrified man was gone, but life at the cave was bustling. George Chamberlain, a real estate dealer from Illinois, reportedly purchased a share in Wind Cave, and for a time was identified as the traveling secretary. He talked of setting up a motor line between Hot Springs and the cave and of bringing several excursion parties from the Chicago area. A post office was established at the cave, and George Stabler was appointed postmaster. In early 1893, developmental work was progressing rapidly and eight men were enlarging passages and making other improvements. A visitor in the spring noted that the "darkness of the side passages, domes and chasms is [now] lighted up so as to render additional enchantment to the wonderful scenes." A brass band played for the first time in the depths of the cave.

Onto this thriving scene in May 1893 came the mind reader, Professor Johnstone. In Hot Springs, he gave an exhibition for some 100 people in the Evans Hotel, finding a "pin that had been secreted in the hotel." A week later, Johnstone and his manager, M.E. Rice, were at Wind Cave, where Alvin's diary notes, the three of them discovered 11 new chambers.

Records don't indicate what happened in the next few days, but John Stabler and the other cave entrepreneurs must have seen Johnstone's arrival as a golden opportunity for publicity, while Johnstone saw his visit as an opportunity to make some money.

On May 31, 1893, the Hot Springs paper announced "Johnstone's Wild Undertaking." Johnstone

was to go blindfolded into Wind Cave and find a pin that was hidden there by "a committee of citizens and scientists." No time limit was put on his attempt. At least two Hot Springs citizens were betting $1,000 and $2,000 with Johnstone's manager that the pin could not be found. A wild undertaking it was, and before the event was over, the name of Wind Cave was known across the nation.

". . . Johnstone is to be locked in a suite of rooms in the Evans [Hotel] with two chosen citizens and the doors and windows sealed. Also two guards, who are chosen citizens, to be stationed in the hallway preventing any possible agency of confederacy, while Johnstone is thus watched. Another committee are to drive to Wind Cave . . . hide the pin and return with the same to the Evans. The blindfold is not to be removed during the trial, and the time for finding the pin head is unlimited. The cave has now been explored for ninety miles and is literally full of dangerous chasms, dizzy heights and monstrous rooms making it perilous for even the guides, and for Johnstone to undertake the passages blindfolded appears to be simply a guarantee of an awful fate. . . ."

The next day, John Moore, a reporter for the *Deadwood Daily Times,* arrived. His reports of the episode were also filed to the *Omaha World Herald,* and subsequently the stories were carried by newspapers across the country.

Hot Springs, the local newspapers noted on Monday, has "been all agog over the Johnstone matter for the past few days. . . . The trip by Johnstone to the cave was deferred until Sunday morning, on a telegram that the Elkhorn [railroad] photographer would be here to take photographs of his starting. . . . Meanwhile, Johnstone was kept penned up in his room and was wrought up to a great pitch of excitement, until it was hard to keep him quiet. On Sunday morning a great crowd assembled in front of the Evans and amid much excitement the start [for the cave] was made. No sooner had the light made an impression of the motley scene on the photographer's plate than Johnstone, standing upright in a conveyance in which were seated the committee . . . and the press reporter Johnny Moore, when [Johnstone] blindfolded . . . laid lash to the horses and went spinning away at a dead gallop. The other occupants of the wagon seemed to think they were

in for it now. With a wild, blindfolded man holding the reins with one hand and laying on the whip with the other, it was a decidedly ticklish place to be, to say the least. On and on they went, passing teams on the road and making turns around narrow curves, it seemed as if the fellow were fully possessed. But they arrived there safely in the incredible time of fifty-two minutes. A bulletin board had been fixed up in front of Eaton & Wilcox's store on which were posted bulletins of a more or less exaggerated nature all afternoon, among them were . . . 'Johnstone wrote letters to his friends and made his will before entering the cave.' Dr. Johnston [a physician from Hot Springs] started earlier this morning to be there ready to attend the mindreader, should any accident befall him or to resuscitate him in the event of a collapse of his physical powers. . . ."

Johnstone was connected at the wrist with a piece of twine to one of the committeemen who had hidden the pin. "This connection, instead of the usual hand clasp, was made to evidence the fact that he was not guided by the muscular twitching of the fingers of the committeeman, but by the mental picture on the man's mind. During the entire trip he did not touch flesh . . . he also had his arms and limbs swathed so that it was impossible for him to get any muscular indications from the committeeman."

Alvin's diary makes no mention of the Johnstone episode, but by this time, he had quit making daily entries and was merely logging discoveries made on various explorations. On June 1, 1893, the day after Johnstone and his manager had visited the cave for the first time with Alvin, the diary has a long list of names and rooms and objects on the various routes Alvin and his family had been exploring. On the list were "Johnstone's Seat" on the Coliseum Route and "Johnstone's Diamonds" on the High Route. Alvin also made two short entries in a ledger kept at the cave to log visitors; one entry told of Johnstone's party entering the cave, and the other told of the completion of their search.

Though Moore's story in the June 11, 1893, *Omaha World Herald* contains some disputable information (did Alvin really become lost while guiding the party?), it captures the flavor of a "wild undertaking:"

"The feat was unquestionably a genuine test of mind reading, as it was impossible for anything savoring of fake to have been attempted. The affair was under the auspices of six of Hot Springs' most prominent citizens, one of whom was a preacher. Johnstone's quest came nearly resulting in the death of himself and party, as the party became lost in the cave and for three days suffered terribly from starvation, privation and the ever prevailing thought of their seemingly impending doom. . . .

". . . At 1:30 the party were at the mouth of the cave, from whence was issuing the wind with a terrible roaring sound, its velocity being fully 150 miles an hour. The dark opening and the fast rushing wind were enough to stagger the stoutest hearted, and many tried to deter the mind reader, who was in a terribly nervous state, from making the attempt but he only said, 'Come! We must find the pin head!' Before descending he made the party swear to stay with him, to which they agreed, then making his will he bade goodbye to the sunshine and started on his perilous trip, his last instructions being that searchers were to be sent to the rescue if the party did not return within 24 hours. . . .

". . . Down this terrible passage the party, Johnstone at the head, descended until the last tier of chambers was reached. Here a passage to the right was taken. From there on the party encountered dangers which were enough to turn the hair gray. The route lay over deep fissures and up the sides of great abysses, every step being taken with the utmost care. The trip was a veritable Alpine climb, with the attending danger a hundred times greater. For the first 24 hours, Johnstone went steadily forward, but after that he became delirious and the party became despondent.

"The despondency grew when the guide, Alvin McDonald, informed the party that they were in an unexplored region of the cave, from which he did not know the way out. For the nonce the pinhead was abandoned and the party turned attention to extricate itself. From then until Wednesday morning the party wandered aimlessly about, suffering much from mental anxiety and the numerous hurts received. Their scant supply of provisions was giving out and the candles were at ebbs. Johnstone became delirious and raved continually. The party only by

dint of willpower was prevented from becoming crazy. All devices to enliven spirits were resorted to and [to] keep the spirits up. Whiskers were singed by candles and all manner of tricks were performed to divert the mind from the situation.

"Wednesday morning the party was very much discouraged and was on the verge of giving up the fight when the guide, who had been on a tour of inspection, came in and announced that he had, he thought, discovered the way out. With joy the party picked up its belongings and followed him. For eight hours . . . the party [was] being encouraged at every step by the guide, who was getting into old familiar territory.

"The Standing Rock chamber was reached. Here Johnstone began to tremble violently and with a bound rushed into the chamber and went direct to the hidden pin head. Instead of collapsing as was anticipated, he bore up bravely under his great mental strain and kept up until the Methodist Church chamber where he collapsed completely . . . ."

But Johnstone was soon revived and the group left the cave. "HE FOUND THE PIN . . . A Most Wonderful Performance" is what the *Hot Springs Star's* headline said. And in the cave ledger for June 7, Alvin wrote: "Paul Alexander Johnstone found the secreted pin head in the Standing Rock Chamber at 9:25 a.m. and arrived at the entrance at 1:20 p.m. nearly exhausted, being in the cave 73 hours and 20 minutes."

Whatever the truth of the whole affair, Johnstone's episode caught the people's imagination–and, depending on your point of view, projected Wind Cave to new heights or depths of recognition.

The cave did receive some truly legitimate national recognition at the 1893 World's Fair in Chicago. Alvin and his father went there to exhibit and sell specimens from the cave. And the trip to Chicago might have been highly successful, had not Alvin become seriously ill on his return. He had typhoid fever (some said pneumonia); his constitution had always been weak, so the illness hit him especially hard. He died within a month–on December 15, 1893.

Alvin was only 20 when he died. But in the three and a half years he was there, he explored hundreds of passageways, many of which were not entered by

After Alvin McDonald died in 1893 at the age of 20, a statue of him was erected at his gravesite. It was later replaced with a plaque, and no one seems to know what happened to the statue.

man again for several years, and some of which perhaps have never been entered again. The diary he left behind has proven to be a valuable record of the early explorations of various rooms and passages –an historical core of the cave's exploration.

The last detailed entry in his diary was in July 1892. The entries for the rest of the year and for 1893 are limited to brief statements of discoveries within the cave, the date, and by whom. Judging from the dearth of the later entries and his minimal notice of Professor Johnstone's dramatic visit, some people believe that Alvin made another more elaborate record of the 1892-1893 period–and that the journal was lost. The original copy of his diary was passed down in the family and most recently was owned by one of Elmer McDonald's daughters.

On December 17, 1893, Alvin was buried on an overlook east of the cave entrance. The gravesite was covered with crystals and specimens from the cave he loved so much. As a remembrance, a Hot Springs sculptor carved a full-size likeness of the young guide from Black Hills sandstone. The statue was kept veiled until the cave's opening day in May 1894 at the request of the McDonalds and Stablers. It was a prominent feature of the Wind Cave landscape for many years but was later removed and a bronze plaque installed in its place.

The Stablers Take Command

With the passing days, the presence of "Uncle John" Stabler and his family was felt more and more. According to his daughter, Katie, "Papa visited all the hotels in Hot Springs, getting people to come and tour the cave." George Stabler ran the Wind Cave Hotel for the first year in 1892 until his father could sell out in Hot Springs. Later, Katie recalled, "My father, mother, brother Charles and family and myself lived on my homestead" near the cave. Her homestead was the Wind Cave horse ranch, which was purchased in 1894 from Charles H. Valentine. Katie noted she "had the deed to the only spring of water a mile away and when the stage coaches would come to water horses, (they) would pick me up to guide the party."

This handbill, found in the cave in recent years, advertises a five-hour stagecoach excursion from Hot Springs to Wind Cave, "the Great Freak of Nature."

EXCURSION

BY STAGE

Will be run from Hot Springs to the Wonderful WIND CAVE on

Those wishing to see the Great Freak of Nature will be furnished with transportation to and from the cave, a light and a competent guide to conduct you through the caverns, all for the sum of $2.00.

Stage starts from the Hot Springs House at 7:30 a. m.; The Gillespie at 7:45 a. m. and Hotel Parrott at 8:00 a. m.

The Excursion will leave so as to arrive at Hot Springs at 6 p. m., thus giving FIVE HOURS in which to view the Cave.

Tickets for sale at the Gillespie, Hot Springs House and Hotel Parrott.

J. D. McDONALD, Prop.

She began exploring the cave herself in 1891 when she was 19 and guided "a few people in the cave that first season 1892." In later years, some people would dispute that Mary McDonald had been the first woman guide in Wind Cave, saying instead that it was Katie Stabler. According to Katie, she "continued to guide steady for 11 years until 1902."

Just as the McDonalds were involved in working and exploring the cave, Katie said the Stablers "explored winters and my family spent 11 winters blasting and opening routes and making them passable for women to go through without overalls."

"I loved to explore and seldom missed a trip," she recounted years later. "It was a great thrill to go into a room anywhere from 12′ by 12′ to 3 acres of floor surface that no one had ever set eyes on before. The ceilings and sides festooned with beautiful formations, sparkled like diamonds, large rocks strewn everyplace and fun to make out images of faces, animals, etc. . . . On one occasion we were in there 18 hours with temperatures of about 45 degrees. When we were tired we rested, but we never caught cold. In fact we had some asthmatic people stay with us to go down and breathe that air.

"One experience I remember, Papa and I were exploring and had, it seems, been in the cave about two hours or more. . . . I distinctly remember coming to a small room about 12 feet around shaped like an Indian teepee, the center having a strong draft. Papa had become tired and laid down to rest (he often went to sleep when tired in the cave and never caught cold). I looked down this hole and seeing some rocks that I thought I could reach with my feet, let myself down, my arms resting on the floor until I got my balance. I sat down and lit some magnesium ribbon which I used in large rooms while guiding. I was greatly thrilled being the first person in a room no one had ever been or seen before. It was truly beautiful. It was a very high room, about 100 feet by 50 feet wide. A portion of the ceiling about 30 feet by 15 feet had fallen just about the middle and in falling cracked open. It had the iridescent chocolate-colored crystals found no other place in the cave. The rest of the room including the floor was covered with what we called satin spar which glistened like diamonds. The pret-

tiest room I ever expect to find this side of heaven. I called Papa and after exploring the room further, we gathered some of the loose pieces of crystal and started our long hard crawl out. As far as I know this room was never named as it was too hard to get there and was not shown."

While exploring in the cave, they often crawled on their knees and sometimes pulled "ourselves through on our stomachs. Many times we would have to make a bridge of our bodies for the others to come across on. We kept ourselves well-padded where needed." Katie said her father devised "a code of signaling by tapping rocks. One tap, two taps, three taps and then two and a one tap—all meaning something like 'come I've found a new room; I am lost; am in the dark, etc. . . .' "

Besides being explorers, the Stablers were also entrepreneurs. The Wind Cave Hotel was an example of their aggressive financial undertakings. The two-story frame hotel first was built on a hill near the cave but later was moved off the hill and two wings were added. "One wing was for an office and one for a kitchen and two bedrooms," Katie recalled. "The lower part of the original building we used as a dining room and we served dinner to all who wanted."

A log house was built over the cave entry, "the front room being directly over it and the trap door made in the floor and steps built down 155 feet to the first passage of the cave." Katie said "the wind blew so strong at times it took two of us to raise or lower this door according to which way the wind blew and after it got to the first level, there was no strong wind but a regular system of circulation. Some routes of wind going in and some coming out. In fact, we used this draft to aid us in exploring. All of the rooms had two to a dozen openings and we would take our candle and put it in each opening and the one with the strongest draft indicated the largest country ahead."

Visitors from Hot Springs could ride a tallyho service run by Chris Jensen or could pay 75 cents to ride to the cave and back with the mail carrier. An advertising card said the "wonderful Wind Cave has more miles of passages, larger rooms and more magnificent scenery than any cave ever yet explored." McDonald and Stabler established a minia-

ture cave in Hot Springs to attract visitors. Katie Stabler ran the operation, for which a 25-cent admission was charged. Visitors received free specimens from the real cave and were encouraged to go out and see it for themselves. The *Deadwood Times* noted "ladies can [now] go through the cave without being subjected to the ordeal of wearing overalls and jumpers." But the ladies still donned white caps.

Larger groups were now visiting the cave; on an August day in 1894, seventy-five people made the trip and the local paper noted: "At each chamber the procession would halt until all had arrived, when Uncle John Stabler would make a few explanatory remarks, tell a story, and start a song familiar to all, which made music indeed as it reverberated through the endless apertures of the craggy cave. Mechanics' band made the old cave ring with music at each chamber, and with the band and Uncle John, the cave was merry throughout." The Garden of Eden Route, the shortest, took about three hours.

In the summer of 1895, apparently to stimulate interest in talk about a railroad line from Hot Springs to Wind Cave, Stabler told the Deadwood paper "many persons have been unable to visit . . . on account of inadequate transportation from town." Yet the visitors continued to come, including famous ones such as presidential candidate William Jennings Bryan in 1896. Katie recalled how she sang the following campaign song to the tune of *Yankee Doodle* while, simultaneously, her father spoke:

"Billy Bryan left the Platte
To see the great convention
Was nominated President
And now is all contention

Billy, Billy keep it up
Speak a little longer
For every word you utter
Makes our side a little stronger.

Billy McKinley, Billy McKinley
High tariff and protection and McKinley."

William Jennings Bryan, like a true presidential candidate, holds a child on his lap during his tour of the cave in 1896. That's John Stabler on the far right and his daughter Katie behind him.

In the early days, Jesse McDonald had been a favorite with editors in Hot Springs. But as time

passed, the pendulum swung to the jovial John Stabler. In late August 1895 an apparently testy McDonald showed up at the offices of the *Hot Springs Star* ". . . and ordered the discontinuance of the weekly to his address, intimating as his reason for doing that he didn't have much use for Hot Springs anyway, and that he should probably close up the cave next season entirely."

Later, the paper said it had discovered the real reason for McDonald's outburst: a senator and congressman had visited the cave, and McDonald thought the paper had not properly reported the event.

The seeds of trouble were growing between the McDonalds and the Stablers in these days. According to Emma McDonald, "the Stablers bought ranches and stock while the McDonalds had to charge their groceries during the winters to live. John Stabler's oily tongue and cheery smile still had J.D. McDonald hoodooed. He could not and would not see how things went. He thought the Stablers were infallible. But he had overlooked . . . his wife Maggie . . . she knew and after a time things began to happen. In the spring of 1896 J.D. McDonald made the Stablers show the office books and finding (in their own accounts) that they had overdrawn their allowance enormously, he kept the books and put Elmer McDonald in charge of them and the office, giving the Stablers a chance to pay back what they showed that they had overdrawn in small payments. They were angry and quit work."

Into The Courts: Who Owns What?

That incident was indicative of the problems that had been brewing among the McDonalds and Stablers and the South Dakota Mining Co. since Alvin's death. Early in 1894, a brief but telling notice appeared in the Hot Springs paper indicating that the McDonalds and Stablers had gone to Rapid City to place filings on the land around the cave. Other records indicate that on January 15, Jesse McDonald filed on land surrounding the entry to the cave, and that his son, Elmer, and George Stabler filed on adjoining lands. On March 15, Katie Stabler and Pete Paulsen, a friend of the Stablers,

filed on other tracts, and on March 19, Susanna McDonald, Jesse's mother, followed suit. On July 25, Margaret Drinkhahn, Jesse's second wife, whom he had married that summer, filed too.

These claims added to what already was a complex situation concerning the cave's ownership. In the early 1890s, the McDonalds were running the cave for the South Dakota Mining Co., of which John Moss and his son, Robert, were the key officers. But even prior to the time he filed for a homestead in 1894, Jesse McDonald had sold a share of the cave's operation to John Stabler. McDonald, Stabler, Charles Stabler, and two other men formed the Wonderful Wind Cave Improvement Co. to promote and direct the cave's operations; an advertising card for the firm designated McDonald as proprietor and John Stabler as general manager.

Years later, Robert Moss' daughter said that Jesse filed on a homestead at the suggestion of the Moss family lawyer so as to firm up ownership of the property for the South Dakota Mining Co. McDonald was quite willing to do so, she said, as he was "very grateful and appreciative for all that had been done for him and his family."

Whether McDonald did follow Moss' advice is unclear. He didn't file on the homestead until January 1894, and by that time, the South Dakota Mining Co. already was seeking a judgment against the Wonderful Wind Cave Improvement Co. The suit, filed in July 1893, asked for $2,700 for rents and profits on the cave since January 1, 1892, for $1,000 in damages, and for restitution of the land and premises. Quite likely, the McDonald and Stabler moves to file on the land in early 1894 were precipitated by the suit.

Adding to the confusion were two court suits by Peter Folsom of Custer, who claimed the Moss family owed him for assay work on their claims.

The court ordered Moss to pay Folsom $700 plus costs for his work, or the mining claims of the South Dakota Mining Co. would be auctioned off. The bill was not paid, the claims were sold, and Folsom purchased them for $860.73.

As the months passed, Folsom and the Stablers apparently joined forces, seeking to oust the McDonalds from the cave site. The lines of argument were sharpening, with the McDonalds claiming agri-

cultural rights to the land over the cave, and the opposition claiming the mineral rights–and the cave itself.

In the early days of October 1896, the Hot Springs paper came out on the side of the Stabler forces, saying the full benefit of Wind Cave would never be "realized so long as the short-sighted, narrow-minded, insolent policy of the alleged proprietor is continued." The next week, the paper reported: "Honest John Stabler, junior member of the firm of McDonald & Stabler and one of the proprietors of Wind Cave, objects to being excluded from an equal proprietorship with Mr. McDonald in that great curiosity. Mr. Stabler says: 'There are articles of copartnership existing between Mr. McDonald and myself that are as binding as such articles can be. Mr. McDonald has the same interest in the cave that I have and I certainly am entitled to as much credit for the improvements that have been made

As proof of their venture underground, tourists often would pose for group pictures around the turn of the century. Note their rather elaborate dress and their candles.

and the publicity that has been given the cave as is Mr. McDonald. I have done most of the work, spent a good deal of money, and until the past year have had entire management of the business. During the past year Mr. McDonald has been at the head of affairs and now is anxious to kick me out. I want it distinctly understood that I am still a member of the firm and am one of the owners of the cave. I do not propose to be bulldozed or intimidated and will continue to assert my rights.' " Stabler's comments seem to confirm Emma McDonald's report that the McDonalds took over control of the business affairs sometime in early 1896.

By the end of the year, however, the Stabler forces had seized the upper hand again. Emma McDonald wrote that Folsom, fresh from his court victory, "went to the Stablers. Together with him, McAdams (living near the cave) and one (William) Ranger (their tool) of Hot Springs, they broke into J.D.

Sam Whiting and his bride Lizzie exchange wedding vows in 1896 in the first of several weddings in the cave. Pundits often commented that the brides had promised their mothers they would never marry the man in question on the face of the earth.

McDonald's house, covering the entrance to the cave and when J.D. McDonald and his son, Elmer, tried to go into the house, they met them in the door with guns, saying that they had minerals in the cave and they were there to protect their property and no McDonald could enter."

Whether or not the McDonalds were ousted with guns remains unclear, but sometime in the winter of 1896-1897, possession of the cave entrance passed from the McDonalds to the Stablers, and as the 1897 cave season approached, "Jolly" John Stabler and his partners were reported to "hold full sway." Wind Cave was "connected with the outside world" by telephone. Stabler said the visitors were more numerous each day.

And the two sides continued their fight. In the spring of 1898, three investigators were brought in by the McDonalds "to see if they could find any mineral deposits that would make the land more valuable for mineral than agricultural purposes." Two weeks later a group of scientists came down from the School of Mines in Rapid City to "make an expert examination" for the Stablers.

The group noted what the McDonalds and the Stablers had already foreseen: "That the Wind Cave in some future day will be of much value, and is the object of the greatest interest to the public as well as the state."

By late April 1898, the two parties had submitted all of their evidence to the land office in Rapid City and were pressing the U.S. Government to decide who had rights to the land in the cave area. The testimony was voluminous, and a final decision was not to come for more than two years.

But their dispute had caught the public's attention, and other persons began to talk about using the land in other ways, perhaps for a national park. In the latter months of 1899, government officials in Washington and Rapid City exchanged letters in which they talked of a "proposed Wind Cave National Park." And early in December 1899, special agent C.W. Greene of the General Land Office, who was investigating the Stabler-McDonald claims, wrote a letter to the commissioner in Washington in which he appears to have locked the door against bids from the McDonalds and Stablers for rights to the cave area. He came down hard against

both arguments–that of the McDonalds that the land was good for cultivation and that of the Stablers that the land contained valuable minerals.

In a key paragraph reporting on the agricultural possibilities, Greene said: "The fact is, if all the land under consideration was given to one man, it would not pay to try [to] cultivate it, as all he could hope to use would be small plats found in the bottom of these dry ravines."

Speaking to the question of mineral developments on the surface, Greene reported: "I looked the ground over carefully, but found no evidence of legitimate mining, [and] I find *nothing* upon the surface that I *deem worthy of consideration* when looking for legitimate mineral development. . . .

"I hear the mineral claimants talk about the large amount of money they have expended in the cave, but when I look for the assessment work, I find they have done considerable work in opening passages so that tourists can pass through without crawling as they did at first, but I do not find any shafts have been sunk or tunnells driven into the rock as is usually done when in search for precious metals, and I take assessment work to mean *mineral development.*"

Then, sounding the death knell for both families, Greene concluded, "I am of the opinion that none of the claimants, either the agricultural or mineral who have fought through the various hearings ordered by your office, would spend a day's time or a dollar in money if the cave were not there; it appears to me that the object to be attained is a patent to the land, and then the cave would be all you would hear of."

The End and the Beginning

Shortly after special agent Greene's report to Washington, the Federal role in Wind Cave's future widened, and the McDonald and Stabler influences declined. The Department of the Interior moved in January 1900 to withdraw temporarily certain lands around the cave, "pending determination of the question of advisability of recommending the setting of said lands apart as a National Park for the purpose of preserving the beauties of the natural curiosities of what is known as Wind Cave."

The Stablers continued to run the cave in the summer of 1900, but by December the Hot Springs paper reported that the Secretary of the Interior had decided the case of the South Dakota Mining Company and Black Hills Wind Cave Co. versus Jesse McDonald. (Earlier court records show that the mining company, owned by the Moss family, had sold its Wind Cave claims to Peter Folsom, who subsequently became president of the Black Hills Wind Cave Co.) The Interior Secretary said that neither party was entitled to the Wind Cave land, "that in the first place it is not mineral land and the plaintiff therefore has no claim to it, and in the second place, McDonald did not comply with the law relating to the cultivation, and his entry is held for cancellation. The secretary also directs that the land be held in reserve until Congress shall have had an opportunity to create a permanent reservation there."

Jesse McDonald quite likely read that account in the *Hot Springs Weekly Star*, and about the same time he was told of the decision in a registered letter. Likely these events helped stir his final major attack on the Stablers. While the Stablers were away from the property over the cave entrance on the following Sunday, Jesse and his son, Roy, took over what, to the old man, was his property.

Peter Folsom also lived in the building in a little apartment in the back. He, too, was away when the McDonalds arrived.

The Stablers apparently gathered a "gang of neighbors" and got their guns, with the intention of retaking the property. A neighbor, Bob McAdam, recalled: "I remember, I was just a kid, of course, them saying that possession was nine points of the law, and they was for getting possession."

Folsom carried an ax to break in the door and when he began to chop away, the two McDonalds fled into the cave. The Hot Springs paper reported: "They remained hid away in the cave until Monday, when the boy made his appearance and asked to be permitted to get away, which was of course freely granted. He saw that matters were not so badly agitated as he had expected, so asked if his father might go also. This request was also gladly granted, and Mr. McDonald and son were not long in hieing themselves hither–much wiser after 24 hours fasting down in the cave."

While Jesse McDonald was down in the cave, his cabin at Mayo burned to the ground, and his beautiful collection of Wind Cave specimens was destroyed.

In the spring of 1901, the situation continued to change rapidly. Special agent Greene took control of Wind Cave, representing the interests of the Interior Department.. And "Honest John" Stabler died on March 13 at the age of 53. He had been ill for about a year with an inflammation of the kidneys. Some accounts say he never fully recovered from the prairie dog bite he received some five years earlier. "When Papa got very sick," his daughter Katie noted, "we sent for Mr. Johnstone (the mindreader) and he hypnotized him with the thought that his pain was all gone. That really helped him more than doctors or medicine." In reporting Stabler's death, the *Hot Springs Weekly Star* said cave visitors would "most pleasantly recall his happy stories and interesting descriptions of the various chambers and passageways of the cave. He was an entertainment in himself. It is thought that the worry and contention over the legal controversy concerning the cave had something to do in bringing on his illness. . . ."

Stabler was gone and the government was in control. A visiting writer, Edward Horn, noted the "rigid" rules of the new manager. He wrote that a U.S. Government warning, "17 x 23 inches in size, printed on linen, has been posted in many conspicuous places about the hotel and cave entrance" and that "each underground tourist is expected to shake the dust from his feet on making his exit. . . ."

The cave opened for another season in 1901 with the Interior Department overseeing the operation. Some old faces remained; George and Katie Stabler and Elmer McDonald continued to serve as guides. But Katie and Elmer apparently left in 1902, while George Stabler was granted a concession to run the Wind Cave Hotel–something he did for about a year.

In February 1901, the government canceled the homestead entries on two key pieces of land–those of Jesse and Elmer McDonald. Because of a finding that they had never properly established ownership by cultivating the land and improving the property, the McDonalds were not paid for the property by the government. Both the Stablers and the McDonalds claimed the government should have paid them for some 12 years of exploration and development work

In 1902, nine years after Alvin McDonald died, Elmer McDonald touted himself as "The only student of geology and scientific guide at Wind Cave." That apparently was his last year as a guide at the cave.

in the cave, but they never proved they owned the land, so they were not reimbursed.

The move to make the land a national park continued, and in June 1902, the U.S. Senate approved a measure to set aside lands for a Wind Cave National Park; the House did the same in December. On January 9, 1903, President Theodore Roosevelt signed the legislation, culminating the private disputes over the land and opening a new era for Wind Cave. William A. Rankin was named as the first superintendent of the national park with a salary of $75 a month.

Epilogue

In Willa Cather's novel *O Pioneers*, one of the characters spoke of the relationship between life and land in the West: ". . . the land belongs to the future . . . that's the way it seems to me. How many of the names on the county clerk's plat will be there in fifty years? I might as well try to will the sunset over there to my brother's children. We come and go, but the land is always here. . . ."

The land around Wind Cave has changed little since the tumultuous days of the McDonalds and the Stablers. The buffalo never came out of the cave as the Sioux Indians envisioned, but the mighty animals again roam the grassy hillsides and valleys of the parkland, thanks to a government restoration program.

The McDonalds and Stablers are gone, but their names linger now in the living history programs at the cave, and occasionally some descendants visit the cave. After the park was created, the two families went their separate ways. Both families were bitter over the loss of the cave, and descendants say that many would not discuss the subject even in later years. Jesse McDonald died in 1932 in Minneapolis, Elmer died in 1963 at age 91 in Tampa, Florida, and Emma died in Florida in 1940.

Charles and George Stabler died in Colorado in 1936 and 1946 respectively. Katie Stabler went east, was divorced, and married again in New York. A copy of her memoirs was presented to Wind Cave in 1966, and a grandson later recalled how she used to

talk a great deal about the early days at the cave: "Her life was so colorful then that I don't think she was satisfied with it after that."

Katie's father, John Stabler, is buried in a rocky hillside in Evergreen Cemetery in Hot Springs; his wife, Lydia, who died in 1939, is at his side. In addition to their headstone, a simple tablet marks Stabler's service in the Civil War with Company B, 1st Wisconsin Cavalry. Lilac bushes and evergreen trees adjoin the gravesite, and an epitaph on Stabler's stone reads: "His toils are past, his work is done, he fought the fight, the victory won." No mention is made of his role in the development of Wind Cave.

Today, the exploration of the cave continues. When Alvin McDonald noted in his diary that he'd given up the idea of ever finding the end to the cave, he was saying something with which modern-day spelunkers can identify. No end is in sight.

In the 1920s the park superintendent supposedly sent this picture to Washington to show off the new sign he had erected near the visitor center. He was immediately told to remove it as something not befitting the national parks.

How the Cave Rooms Got Their Names

Many people visiting Wind Cave are curious about the origins of the names for cave rooms. By tradition, the people exploring and mapping the cave have had the prerogative of naming the rooms and formations they find, and that's how most of them came about.

In Wind Cave the primary formation is "boxwork." When most people see the formation, they think of a "honeycomb." So, why is it called boxwork? We have to take ourselves back more than 90 years to the early explorers of the cave. To them this odd formation resembled the open-faced boxes in post offices from which they took their mail. Naturally they called the formation "post office boxes," but in a short time the name was shortened to "boxwork." Of course the room in which these boxes were found is called the Post Office. Some recent explorations in the cave have turned up boxwork that is 1.2 to 1.5 meters (4 to 5 feet) across. It is called "cratework." Other boxwork is so fine it is called "lacework."

The early explorers also named areas that may be associated with the period of time in which they were exploring. One example is a small hole in the ceiling of the Post Office that is called "The Sears & Roebuck Mail Ordering Chute." Alvin McDonald drew a map of Wind Cave to take to the Columbian Exposition in 1893. It seemed only logical that he name one of the cave rooms Columbian Hall.

The popular books of the time also have given names to rooms. Alvin found and named Monte Cristo's Palace and Dungeon. More recent explorers found an area which they called "Shelob's Lair," from Tolkien's popular trilogy The Lord of the Rings.

One room, shown below, was called Fallen Flats by Alvin McDonald, but the name was changed to Grand

Army of the Republic Hall in June 1899. Ninety-six Civil War veterans attending a reunion in Hot Springs ventured out to the cave for the dedication. Since then many people claim to see breastworks and other military fortifications in the room, perhaps proving once again that you see what you want to see.

It seems only natural that people name places for themselves. Wind Cave has a Stabler Pass and many other rooms named for early explorers. Present-day explorers try to refrain from naming places after themselves, but once in a while others name places for them.

Biblical names are common in Wind Cave. Among them are "The Pearly Gates," "Garden of Eden," and "Samson's Palace." "Pearly Gates" may have gotten its name from the crystals on the end of the boxwork in that room.

So, when you look at a map of Wind Cave (pages 26-27) and see "Bayberry Candle Room," the "Nuthouse," the "Padded Cell," and the "Nudist Colony," you will know there was some reason for the name. The reason may be unknown now, but it's fun to wonder about the origin.

The Cave's Formations

The Wind Cave of Alvin McDonald's day had no electric lighting, concrete steps, asphalt flooring, or excavated passageways. Seeing the cave called for strenuous effort. The tunnels were seen by candlelight, and the flickering light must have made the maze of formations eerie and the surrounding darkness ominous.

Today we can walk through much of the cave in an upright position, with firm footing, and with lighted passageways. Despite these conveniences, entering the cave is still a strange experience, for we leave the realm of light and life and enter an alien world of darkness. We are oppressed by the cool hush, and closed in by strange formations.

Wind Cave is known for its extensive networks of "boxwork." These cobwebs of thin, interlacing blades of calcite projecting from the ceiling and walls of passageways are formed by an interesting natural process. When rainwater seeped into the ground, it absorbed carbon dioxide from decaying vegetation, becoming acid and capable of dissolving limestone. As ground water, supersaturated with dissolved limestone, seeped into the many cracks and fissures in the stratum, calcium carbonate crystallized into a form called calcite. As the calcite accumulated in the interlacing cracks, the limestone that separated them dissolved away, forming the cave and leaving only the calcite "fins" standing out in bold, delicate relief. No other known cave in the world displays the size, amount, and variety of boxwork that Wind Cave does.

Two other abundant formations are "popcorn" and "frostwork." Popcorn, technically called globulites, resembles a sea-coral structure, whereas frostwork, similar in chemical composition to popcorn, varies in size and appearance; it may be seen as small hairlike structures or as large formations resembling the halves of snowballs. These features probably began forming when the water table in the cave was lowered and the carbonate-saturated water seeped from the wall and deposited layers of carbonate on the outer surface.

Chert, a hard, silica-rich rock resembling flint, can be found in several areas of the cave. Sandwiched between layers of limestone, the thin layers contain fine examples of shell-type fossils.

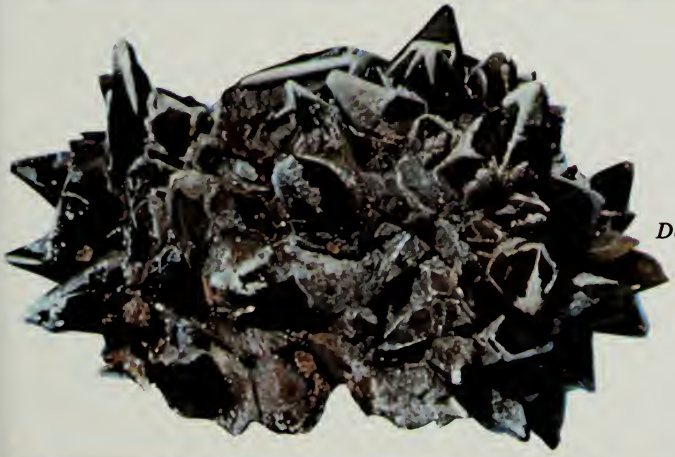
Fossil plants appear to be in these layers also, but in reality the graceful, lacy formations of black crystal are mineral deposits called dendrites. They were formed in the same manner in which frost forms on a window: water vapor, carrying minerals, slowly consolidated these minerals on the chert, producing a fernlike pattern of accumulated cystals.

Among formations not commonly seen on tours are drapery and dogtooth spar. Drapery is formed when water laden with calcite flows down a slight incline and deposits build up along and out from the walls—sometimes in the shape of "mule ears." Dogtooth spar forms when seed crystals develop large faces in still, calcite-saturated water. Usually dogtooth is white or milky white in the cave, but sometimes it is coated with manganese dioxide.

Many other deposits can be seen in the extensive passageways of Wind Cave. Most deposits have ceased forming, for Wind Cave today is for the most part dry.

Boxwork

"Mule ear" drapery



Dogtooth spar

Popcorn

Frostwork

World of Light: A Natural History

By Greg Beaumont

On the wings of a magpie, flashing black and white, the day arrives. Nighthawks settle to ground roosts, their huge, nocturnally efficient eyes narrowed to slits by the offending brightness. Wapiti slip back into the protection of pines after a night of grazing the open slopes. Rapidly the night world of bats and owls gives way to the day.

Up come the prairie dogs, scratching and stretching. A crossing coyote creates waves of momentary alarm. A squabble of pinyon jays starts up in a distant stand of pines. Quickly the grasses lose their shimmer of dew and the mists are dispelled. Grasshoppers sing in the fruited grass, a pleasant, skipping song which makes the earth seem to drowse in its fullness.

High overhead, on set wings, a Swainson's hawk drifts in from the eastern prairie. A buck pronghorn wanders up a shallow draw. The distant dog town produces an indistinct commotion. A jumping spider appears and disappears, and a rustle in the nearby grass suggests that a small animal is scurrying along a mouse run. Except for the continuous chorus of grasshoppers, nothing in this landscape appears to be connected to anything else. A meadowlark has made a great ceremonial fuss in dispatching some large insect, but other than that, the broad sweep of prairie seems to exhibit no survival struggles.

Interrupting its lazy circling, the hawk suddenly veers, faces about, and folds its wings, plunging earthward. The jackrabbit, exploded out of the grass by the hawk's sidelong impact, tumbles down the steep knoll, gains footing and bursts for speed, but it again is intercepted by a clutch of daggers. Its death scream interrupts the singing in the grass and instantly fashions a hundred prairie dogs into listening picket pins. For a second all is focused here, beneath the hawk's outstretched wings. The pierced creature is severed from life by the quick movement of the bird's hooked bill, but the prairie dogs have already lost interest and the grasshoppers, unmindful of their own numerous enemies, resume their singing.

A thistle sows new life in a burst of light.

The hawk circles . . .

The incident at first seems dramatic and horrifying. First impulse might be to feel sympathy for the jackrabbit and loathing for the hawk. By human standards, the ambush of a small, "helpless" creature by a much more powerful predator–especially a hawk, whose design, appearance, and weapons make it such a formidable killing machine–seems brutish and unnatural.

Such a reaction is inappropriate. The coiled bullsnake consuming killdeer eggs while the powerless parent birds cry and fly about distractedly, or a pair of coyotes tearing to pieces a newly born pronghorn kid are doing exactly what nature has intended them to do. Without predators to liquidate the surplus animal population born every year, prey species would quickly overpopulate the land and destroy the habitat for themselves.

In nature there are few one-way streets. Ironically, in preying on rabbits hawks help to preserve them, by lessening competition for food and by removing unfit individuals from the breeding stock. Should prey species suffer population decline, predators, through starvation, are similarly affected. Seen in this light of mutual benefit and mutual control, the relationship between predator and prey is not only desirable, but is absolutely necessary to the balance of the entire wildlife community.

What appears to be a random and haphazard collection of plants and animals inhabiting the prairie, forest, or woodland ravine is in reality a tightly controlled community of specialized life forms adapted to the particular conditions of their environment. Each inhabitant of the community has a role to play, and a particular niche. Both the bison and the pronghorn are first-level consumers; both are grazers, sharing the same territory. They avoid direct competition, however, by occupying slightly different niches. The bison prefers grasses while the pronghorn grazes on forbs and grasses.

In the same manner, by occupying slightly different niches, insect-eating birds of many species will share the same territory without directly competing with one another. The house wren, for example, seeks its food on the ground, while the white-breasted nuthatch forages on tree trunks. From a convenient lookout perch, the eastern kingbird flies up to snatch flying insects in mid-air, while the flicker, a wood-

pecker, forages for ants on the ground and uses its chisel-like bill to get at grubs beneath tree bark. Audubon's warblers and yellow-breasted chats search out insects among the branches.

The hawk has finished with the jackrabbit. Remaining on the ground, the bird continually scans the landscape, alert for any movement. Its piercing eyes give it a regal aspect, as though it were exempt from the harsh reality that weighs so heavily on jackrabbits, mice, and the other prey it daily withdraws from the living community. Yet the hawk, too, owes a debt to the earth that today sustains it. One day the debt will be reconciled. On a clear morning like today, perhaps, while standing on the ground, its wings useless at last with old age, this arrogant-eyed predator will helplessly watch the rapid approach of a coyote.

Then its own stockpile of nutrients, collected at the expense of countless other lives, will be transferred, fueling for a time the demanding furnace of a coyote. What is left over, like today's remains of jackrabbit, will belong to smaller scavengers and the waiting hordes of decomposers. All the countless building blocks that had for years conspired to sustain the stunning evolutionary accomplishment of this one hawk will be released. The complex compounds of life will be reduced once more by bacteria to simple, basic elements. They will return to the living community, the atmosphere, and the earth. These same atoms will again find their way back into the architecture of life–a blade of grass, a ground squirrel, a rattlesnake, a hawk–forever rearranged by the earth's restless appetite for change.

At last the hawk swipes its bill against the ground and flaps into the air. Rising slowly over the warming grassland, it catches an updraft, its wings lock, and it rises rapidly in a tight spiral before leveling off and banking westward.

. . . and the jackrabbit bounds.

Spread out far below the soaring hawk is a complex landscape of rolling grassland and pine-covered ridges. Both are cut by narrow ravines crowded with deciduous trees, and broad, twisting canyons carpeted with grass. The few dozen square kilometers of this

hawk's hunting territory contain a mosaic of contrasting habitats, each with its own distinctive flora and fauna.

Of the three major plant-and-animal communities found at Wind Cave, the prairie is by far the largest. Second in total land area is the forest, composed primarily of ponderosa pine. Snaking through both is the ravine woodland community, home for plants and animals requiring moister conditions than are found in either of the other habitats. Like the hawk that daily inspects this broad terrain, we will explore these different worlds crowded within the boundaries of Wind Cave National Park.

Colorful prairie grasses bend in the autumn breeze.

Kingdom of Grass

The Black Hills rise like a forested island from the surrounding prairie sea. But Wind Cave is predominantly a prairie park. It is situated at the southeast edge of the Black Hills, and its low elevation and correspondingly low annual rainfall produce conditions more favorable to grassland than to forest.

The central part of North America has not always been covered with grass. In the long sweep of geologic time, grassland is a recent development. One hundred million years ago a tropical climate prevailed. For millions of years the existing land mass had been covered with lush tropical forests. Even the great dinosaurs found adequate food in the abundant vegetation. But the climate began to change, partly because of the rising Rocky Mountains. The warm, moisture-heavy air blowing in from the Pacific was now forced upward over the mountains. As the air cooled, the water vapor condensed and most of the moisture fell as rain or snow. Deprived of this moisture, the land to the east of the mountain chain could no longer support forests. The higher the chain rose, the farther eastward the "rain shadow" of the mountain range extended.

The resulting climate was relatively dry and subject to continental temperature extremes. Plants and animals faced new challenges to their survival. Unable to adapt to the stresses imposed by widely fluctuating temperatures and diminishing vegetation, legions of life forms, including the dinosaurs, became

extinct. Among the survivors were the mammals–primitive ratlike forms that had evolved, like the first grasses, during the reign of the dinosaurs.

Just as the warm-blooded mammals filled the void left by the dinosaurs, so the grasses spread and flourished in areas unsuited to forests.

Plants of the Prairie Roadless, fenceless, uninhabitated, on a scale dumbfounding early settlers, this ocean of wild grassland stretched for thousands of kilometers, breeding storm, blizzard, human loneliness and a fear of limitless nature. Even today, the grassland is difficult to comprehend. Our eyes seek trees, landmarks. Like open water, the prairie seems to distort human perspectives of distance, place, and scale, its vast, empty, wind-blown countenance forever turning aside our attempts to *see* it.

This apparent emptiness of the prairie belies its botanical importance; and its significance to animal life–man included–can hardly be overestimated. A single hectare of grassland may contain many hectares of leaf surface exposed to the sun. A great array of animal life, including civilized man, rests squarely on the broad base of this botanical "heavy industry."

Grasses are ideally adapted to the harsh conditions of the open prairie. Unlike woody plants, grasses die back to the soil surface each winter, hoarding their life-germs in protected root systems. And the root system is surprisingly extensive in comparison to the proportion of plant aboveground. A square meter (square yard) of prairie soil 10 centimeters (4 inches) deep may contain 35 kilometers (20 miles) of grass roots. The roots rapidly absorb and store water when it becomes available. Moreover, during times of drought, grasses, unlike woody plants, are capable of going dormant. Finally, since grass grows from the joints and not from the tip of the plant, grass plants can withstand burning and grazing.

Besides being hardy, grasses are highly nutritious, making it possible for many animals to exploit them almost exclusively as a food source. In the early grasslands of the Eocene epoch, some 35 million years ago, great numbers of herbivores inhabited the North American continent. Browse–the leaves and soft tip-growth of woody plants–made up the major part of their diet. However, as the climate continued to grow more arid, less browse was available. To sur-

Rangers are storehouses of information about the wildlife and plantlife of the park. If you have a question, ask them. If they don't know the answer, they probably will be able to direct you to a source that can help.

Continued on page 90

Wildflowers of the Prairie

The association of native American plants that once occupied a vast territory from western Minnesota to eastern Wyoming now exists in only a few protected pockets. To see the flowering plants that constituted this northern midgrass prairie, you need to go to state and national parks where grazing is not permitted and where introduced plants have had relatively little effect. At Wind Cave you can find the illustrated wildflowers blossoming during the periods indicated: Gunnison mariposa lily (May-July); upright prairie coneflower and horsemint (May-September); pasqueflower, the State flower (March-April); starlily (May-June); spiderwort (June-July); shooting star (June-August); small soapweed (May-June).

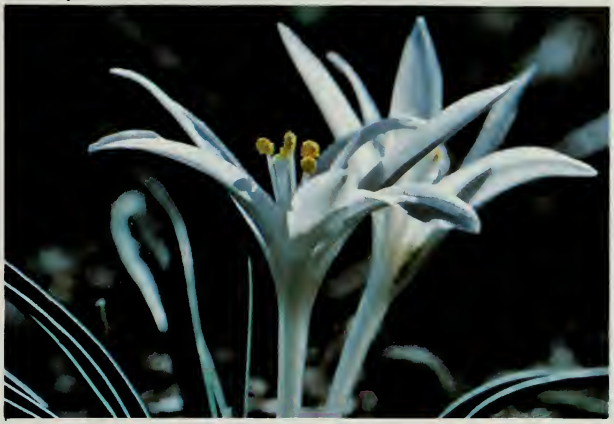
Flowering plants that hazard bloom in early spring must face the rigors of freezing weather. As a result, they tend to be low-growing forms, with flowers disproportionately large. Fine hairs help protect prairie pasqueflowers from cold, drying winds and strong light. These silvery hairs give the massed plants a smoky appearance. Plants blooming later in the season must compete for space. Horsemint and prairie coneflowers tower on slender stalks above the grass.

Gunnison mariposa lily

Upright prairie coneflower (yellow) and horsemint

Pasqueflower

Starlily



Spiderwort

Shooting star

Soapweed

vive, plant-eaters were forced to turn more and more to grass, becoming, in effect, grazers instead of browsers. Unlike browse, however, grass is coarse, because of its large amounts of silica, and rapidly wears away tooth enamel. Those species which could not evolve hard enamel in time to cope with their forced change of diet eventually vanished.

The Black Hills are situated in the midgrass belt, a broad band of medium-statured grasses that runs from Saskatchewan to Texas. To the east is the tallgrass prairie, reflecting a higher average annual rainfall; to the west is the shortgrass prairie, a community of low, hardy grasses adapted to the more arid conditions of the western plains. The midgrass belt, sometimes called mixed prairie, is composed of grasses adapted to the conditions of the central prairie region, which averages about 46 centimeters (18 inches) of rainfall annually. Dominant grass types at Wind Cave are blue grama, western wheatgrass, little bluestem, and threadleaf sedge.

Among the grasses preferred by the bison, blue grama is a shortgrass species well adapted to the driest prairie regions of the western grasslands. It forms a shallow but extremely dense sod and is easily recognized by its horizontal seed heads, which jut out from its 30-centimeter (12-inch) high flower stalks like human eyebrows. Although it may be hidden by the taller midgrasses, it is the most abundant grass species found at Wind Cave.

Western wheatgrass is a midgrass, often reaching a meter in height. A perennial, it reproduces from underground stems and seeds. A hardy, drought-resistant plant, it invades disturbed areas or regions where prolonged dryness has killed off other grasses.

Little bluestem, identified by its flat, bluish basal shoots and gently folded leaf blades, is one of the most widely distributed perennial grasses in North America. Where it finds sufficient moisture, it forms sod. In the midgrass prairie, however, it is usually found as a bunchgrass. Vigorous, long-lived, and nutritious, it has been cut for hay since settlement days.

Sedges are distinguished from grasses partly in having stems that are triangular in cross section. They prefer the moist soils of meadows, marshes, and bogs. Threadleaf sedge, a dark green plant growing low to the ground, is common here.

More than a dozen other grasses and sedges make up the grassland community in Wind Cave, and interspersed are the forbs. These deep-rooted, broad-leaved plants provide the prairie's rich floral display from earliest spring till the hard frosts of fall.

Most grasses rely on the wind to pollinate their seed, but most of the gaudily flowered forbs require pollination by insects. Their bright petals attract butterflies, bees, and other nectar-feeding or pollen-gathering insects.

Early blooming wildflowers, such as the pasque-flower and the common starlily, are short, ground-hugging plants. Unlike the tall summer bloomers, such as the prairie coneflower or bigbract verbena, they do not have to compete with the full stature of the grasses; instead, they must contend with the freezing nights of the prairie's early spring.

Forbs, once established, can successfully co-exist with the crowding grasses, because they are deeply rooted plants and thus avoid direct competition with grass for needed moisture. The small soapweed, or yucca plant, for example, is found on dry, south-facing slopes and may have a taproot more than 6 meters (20 feet) long. In addition, forbs find ample growing spaces in a midgrass prairie habitat, since most of the grass species tend to be bunchgrass rather than sod-forming varieties.

That the prairie can support such an astounding variety of grasses and forbs is made possible by seasonal succession. The grassland landscape is a constantly changing sweep of color and form as different plant species gain ascendancy, claim dominion, then yield to others. Limited space and moisture are thus shared and excessive competition is avoided.

Another form of succession is at work on the prairie, as in every plant-and-animal community. Each plant species–grass, forb, shrub, or tree–thrives only within a certain range of conditions. These factors include available moisture, soil type, exposure to sun and wind, and grazing and browsing pressure. A piece of ground is best suited to certain plant species, and when those species are present and perpetuating themselves, the vegetative climax is said to have been reached.

Many times, however, the climax vegetation is disturbed on a particular site, and the land must undergo a cycle of plant succession until climax is

again reached. Depending on the site, the vegetation involved, and the degree of disturbance, this cycle may be accomplished within a season or it may require years of intermediary steps.

If a piece of dry upland prairie is plowed, years will pass before the climax vegetation re-establishes itself. Invader species, those plants capable of germinating in and withstanding the heat and drought of the exposed, sun-baked earth, will first appear. Others will follow until finally the vegetation is stabilized, and the climax plants–those best suited to the site–again occupy the area.

On a smaller scale, such natural disruptions happen continually. Bison dust wallows, badger diggings, and gopher mounds are disturbances that for a time alter the existing climax vegetation. An active prairie dog town also represents such a condition. By continually cropping the surrounding vegetation, the prairie dogs interfere with the natural succession; they are said to hold the land in a state of disclimax.

Other climatic or physical factors alter the plant composition of the prairie. An increase or decrease in annual precipitation, extended grazing, or repeated fires will favor some species and suppress others.

By harboring so many diverse and persistent plant species, the prairie is assured of a perpetual vegetative cover in a land where the climate is often harsh and always capricious.

The cottontail lives in a brushy habitat. It is a true rabbit, bringing forth naked, blind, and helpless young. The brush provides them some protection.

Animals of the Prairie Suddenly, near the crest of a distant knoll, appears a white patch–then another, then several more. A warning signal, silent but effective, is being passed among a band of pronghorn.

With the single warning bark of a prairie dog, hundreds of eyes scan the surroundings, inspecting sky and ground for possible danger. The prairie dogs remain close to the security of their burrows.

Commanded by the parent bird, a day-old killdeer chick, its coat of natal down dappled with earth colors, instantly settles to the ground and freezes, "disappearing" until the threat has passed.

Snarling and spitting, the badger exposes fierce teeth to an adversary. This animal, too slow-moving to escape a large predator by fleeing on the open prairie, stands fast, ready to fight. But its hind legs continue to dig furiously, and the badger disappears backwards into the ground.

Bison calves move slowly and unsteadily through deep snow, but they are less vulnerable than they appear. In time of danger, bison cows will charge intruders and drive them off, a forbidding defense to protect their young.

When danger is perceived on the prairie, each animal responds in a characteristic fashion, relying on a specialized defense evolved through the ages by trial and error.

Because the grassland provides such an abundance of nutritious and readily available food, it is no wonder that it is heavily populated. But the prairie environment poses one serious problem for animals: there are few places to hide. The animals meet this challenge in various ways–some through speed, some with strength, others through burrowing, social behavior, or camouflage.

The pronghorn is a marvel of movement. For sheer speed and endurance, no four-legged animal on the North American continent can match it. If pressed, the pronghorn can attain speeds of almost 100 kilometers (65 miles) an hour, covering the ground in 6-meter (20-foot) bounds. It can maintain a speed of 70 kilometers per hour for a surprising distance. This sustained energy expenditure is possible because of the animal's structure and its oversized visual, respiratory, and circulatory organs. The leg muscles are attached near the body, allowing the long, powerful legs to move with a minimum of energy-wasting vertical body movement. Even at full speed the pronghorn's back maintains, in contrast to other galloping animals, a level attitude. Moreover, the pronghorn's oversized trachea allows a rapid exchange of air to the equally oversized lungs, and its heart is twice as large as one would expect in an animal of its size. To this add phenomenal eyesight–comparable to that of a man with an 8-power binocular. It is little wonder that healthy adults seldom fall to predators.

Oversized appendages characterize the jackrabbit, another prairie animal designed for running. Unlike the cottontail, which lives in brushy habitats and has the advantage of nearby cover, the prairie-dwelling jackrabbit must first avoid contact with a predator and then be able to outdistance it if pursued. To help avoid contact, the jackrabbit relies on acute hearing. If it is pursued, its outrageously large legs and feet

The jackrabbit dwells on the prairie. It is misnamed, for it actually is a hare, giving birth to fully furred, open-eyed young, which are soon active on the plains. It's difficult to tell the cottontail and jackrabbit apart, so guess by where you see them.

propel it at speeds amazing for an animal of its size. Besides speed, the jackrabbit makes use of the maneuverability its large feet provide to bewilder and tire the pursuer. When chased, the hare holds its ears erect, presenting a conspicuous target. The animal may suddenly stop, however, dropping its ears in the process. In effect, the jackrabbit abruptly "disappears," allowing itself a period of rest until it is again scented or spotted. Continued long enough, the process of hide-and-seek often tires out the pursuer or flushes another possible victim, diverting the predator's attention.

Two pronghorn antelope flash white danger signals.

Social behavior and communication are important survival aids on the prairie. Pronghorn, bison, and prairie dogs find protection in numbers, each member of the band, herd, or town benefiting from the social structure.

The approach of danger is quickly communicated from one society member to another. Equipped with erectable rump hairs, the pronghorn flashes a visual signal of alarm, quickly noticed and relayed by other members of the band, much in the same manner in which whitetails signal with their tail "flags." The pronghorn also emits an odor, serving the same purpose. The prairie dog, on the other hand, employs a vocal signal when first aware of danger. In prairie-dog towns, sentries are constantly on duty to alert the colony to the approach of an enemy.

A badger peeks out of its protective burrow to see if all is clear.

Whereas the pronghorn and the jackrabbit flee from danger and the prairie dog seeks refuge in its burrow, the bison, because of its size and strength, can obviously stand and fight. Even a plains grizzly would respect the authority of a bison's charge.

Prairie birds enjoy the advantage of flight to protect themselves, but they are vulnerable during the nesting season. Accordingly, ground-nesting birds such as the meadowlark and horned lark rely heavily on camouflage, hiding their nests in tufts of grass. Some species–the killdeer and the common nighthawk, for example–boldly lay their eggs on the open ground. Eggs of these species are dappled with browns, greens, or blacks, providing a disruptive coloration that makes them blend into their background. Killdeer chicks, moreover, are *precocial*–capable of leaving the nest almost immediately after hatching to fend for themselves. Also aiding in their survival during flightless weeks is a natural camouflage and

the instinct to freeze when danger threatens.

Not all threats come from animals; the prairie climate requires special adaptations. Perhaps the most remarkable is the pronghorn's ability to acquire all the moisture it needs from the plants on which it feeds. Some bands have flourished for generations without ever drinking from a body of water.

Just as the extreme heat of prairie summers does not bother the pronghorn, neither does the severe cold of winter. Deep snow is a hazard, for the animal lacks the ability to paw through snow to locate food; but on the windswept ridges deep snow is rare.

Most of the prairie's summer populations are not active in winter. All but a few of the bird species have migrated south. The first hard frosts of autumn eliminate great hordes of insects and spiders and other arachnids, most of which first lay eggs that will hatch in spring.

For animals that cannot flee the encroachment of winter, two alternatives remain. One is hibernation. Ground squirrels, gophers, and badgers seek the deep safety of their burrows, sinking into an energy-conserving torpor that sustains them at the very threshold of life during the long winter months. Should the temperature in their dens fall to the freezing point–a condition that would soon prove fatal–an involuntary mechanism in their bodies automatically rouses them, speeding up their metabolisms.

The other alternative in facing the challenge of winter is to continue activity and gamble on finding food. This is seldom a problem for the pronghorns and bison–especially the bison, which sweep away the snow with their heads and beards to uncover buried grass. But it severely tests most of the smaller animals, such as the coyote, jackrabbit, and prairie vole.

During summer, when food is plentiful, the land will sustain a higher population of a given species than it will in winter when food and cover are scarce. As a result, most mammals reproduce more of their kind than the winter "carrying capacity" of the land will sustain. The result is competition. Unable to secure adequate food or favored habitat, the weaker individuals face starvation or predation. Thus, winter becomes one of nature's ways of weeding out those less able to survive, ensuring that only the strongest,

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The Prairie Dog's Communal Style

Safety in numbers is the name of the game in a prairie dog town. The success of the social structure allowed staggering populations of prairie dogs; their "towns" once occupied thousands of square kilometers of the midwestern prairie and Great Plains country.

The most obvious advantage of such communal living is protection from ambush. Hundreds of eyes continually scan the ground and sky for danger. Constant grazing of the surrounding vegetation prevents predators from approaching unseen. As a result, few hawks, eagles, or coyotes regularly include prairie dogs in their diet. Even when the prairie dogs are threatened by their mortal enemies, the badger and black-footed ferret, the maze of burrows gives them some chance of escape.

Although gregarious, prairie dogs are territorial and do not freely mix. A family unit, or coterie, occupies about ¼ to ⅓ of a hectare (¾ of an acre). It consists of one or more males, several females, and up to ten pups. Only the young, inexperienced prairie dogs are permitted to cross unchallenged into an adjacent territory.

In a dire emergency, however, every animal is free to race to the safety of the nearest burrow. After a sudden disturbance –but before the all-clear is sounded—many prairie dogs may be seen desperately exchanging burrow entrances. They apparently feel so uncomfortable in a neighbor's territory that they dash for their homes.

Frequent kissing reinforces the family ties of the coterie; it also quickly exposes an interloper. Prairie dogs devote much time to grooming one another – more than would be necessary simply to remove dirt and parasites. The rites of kissing and grooming appear to reassure each animal that it is in safe company and part of the social structure.

Enjoying a bite

Scanning the horizon

Kissing

Sticking together

Fattened up for winter

Gathering a nest

Black-footed ferret

Badger

Bulldozing

Sounding the alarm

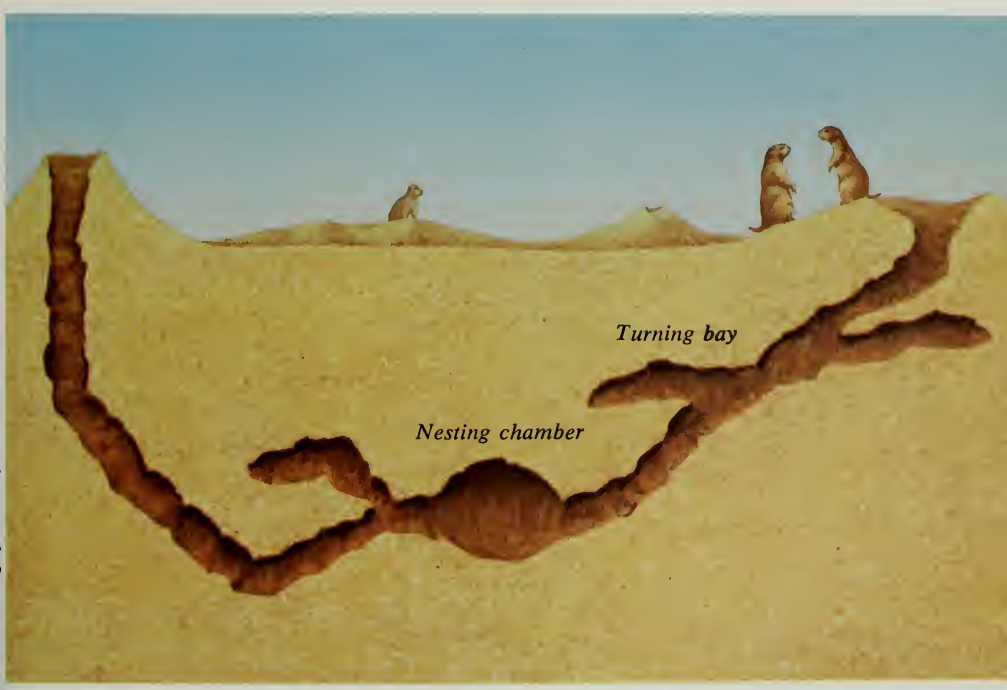
The Security of Home Is Perhaps Too Secure

Prairie dog burrows descend into the ground vertically a short distance, then slope gradually downward some 3 meters (10 feet). The first chamber, a meter or so down, serves as a listening post and turnaround. Other chambers serve as living quarters, nest, and toilet. The living quarters are usually higher than the lowest end of the burrow, a protection against flooding. The mounds of dirt around the entrance also help prevent flooding and serve as a lookout.

Since prairie dogs do not hibernate in winter and subsist largely on accumulated body fat, the burrows must serve them all year. Their deep burrows remain cooler than the outside air in summer and warmer than the outside air in winter.

Four to six young are born in early April but do not venture above ground until they are about six weeks old. Populations are controlled primarily by food availability. Years of abundant rainfall permit vigorous vegetation growth, promoting population increases.

Of the four species of prairie dogs in the United States, only the Utah whitetail is endangered. Wind Cave's prairie dogs are blacktails, which have a far greater range in the West than the whitetails. The blacktails are rapidly expanding in the park. Unfortunately, the most efficient predator of the prairie dog, the agile black-footed ferret, is probably the rarest mammal in North America. The ferret, which is slender enough to enter the burrows, is so dependent on the prairie dog that it was brought to the brink of extinction during the extensive prairie dog eradication programs and has not recovered. A ferret has not been seen at Wind Cave in a long time. If the prairie dogs continue their present rate of expansion, a control program will be inevitable –unless the predators make a comeback.



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wariest, and most adaptable will live on to reproduce the species.

The prairie dog, unlike its ground-squirrel cousins, is not a true hibernator. Warm winter days will bring the animals up to forage during the brief hours of sunshine. Like other winter sleepers, however, they condition themselves for the ordeal of spending months underground by storing up fat reserves during late summer. The fat, sluggish, long-coated prairie dogs that stand on their snowcovered mounds to survey the December landscape hardly resemble the nervous, nimble creatures of July.

Looking out over the limited expanse of Bison Flats, we see a splendid though meager example of what the American prairie so recently was. Before the grassland sod knew the insult of plow and fencepost, this wilderness of grass stretched on and on. For millions of years it had maintained itself. As in every other balanced community of living things, it is the relationships–the interactions of plants and animals with each other and with the physical environment–that sustain the prairie. To exist, every living thing takes something from the environment. But it must also contribute; it must provide some valuable service to the community.

The pocket gopher tunneling beneath the soil surface is mainly concerned with finding enough roots and grubs to stay alive. Occupying a different niche from that of the surface-feeding rodents, it finds in its underground existence a greater degree of protection from predators. Although the gopher's only interest is in its own survival, the animal unknowingly provides a vital service to the prairie community.

Bison once roamed the prairie in immense numbers, a single herd covering as much as 130 square kilometers (50 square miles). Such a concentration of grazing animals moving across the land could have destroyed the ecosystem were it not for a host of other animals, such as the gopher, that quickly helped to restore the equilibrium.

Most animals to some extent resemble their habitat. Here, two whitetail deer stand still behind a tangle of brush, and a pronghorn kid lies in the prairie grass between nursings, its pale brown coat and motionless attitude helping to protect it from eagles, bobcats, and coyotes.

Millions of trampling feet compacted the soil, threatening to shut off the vital flow of moisture and air to the roots of plants. The activity of burrowing animals and insects opened the soil, permitting air and moisture to enter. In some areas it is estimated that the activity of burrowing rodents alone was

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Bison Once Numbered 60 Million

Today bison are a curiosity, found in small herds in a handful of preserves. But when Columbus put a claim to the North American wilderness, the 60 million plains bison that roamed the continent–from the Rockies to the eastern woodlands, from Great Slave Lake to the Mexican interior–were part of one of the greatest concentrations of wild animals the world has ever produced.

In a 55-year period beginning in 1830, all but a few hundred of the continent's existing population of 40 million bison were exterminated in a slaughter of almost unimaginable proportions. Now, a scant 100 years later, it seems incredible to most Americans that the plains, foothills, and forests of 30 states were interconnected with myriad bison trails.

Each spring, bison would migrate northward with the advancing front of greening grass. They would move in huge columns, often 30 kilometers (20 miles) wide; one recorded column exceeded 160 kilometers (100 miles) in width. Above the bison would pass the sky-darkening waves of migrating waterfowl, shorebirds, passenger pigeons, cranes–each species in its appointed time overtaking the vast bison army below. Fanning out at last on the northern prairies, the bison herds would gradually turn and head southward again ahead of the coming winter.

By 1883 no wild bison remained in the United States, and by the turn of the century fewer than 600 survived on the entire North American continent. From this remnant population, the present-day herd at Wind Cave was started. The current world total of American bison is estimated to be between 25,000 and 30,000.

Bison are members of the cattle family. Unlike domestic cattle, they are protected by dense pelts and are capable of foraging in

deep snow. They do not wander in the direction of a blizzard, as domestic cattle do, but stand their ground and face into it.

En masse the bison were a major ecological force on the grassland community. Individually, a mature bison is a force not to be trifled with. Some visitors equate the placid, seemingly unconcerned herds of bison with the more familiar herds of docile domestic cattle. But the bison retains its ancient wild temperament. Unpredictable and at times belligerent, it may without apparent provocation attack any intruder. A mature six-year-old bull weighs upwards of 800 kilograms (1,800 pounds) and is almost 2 meters (6 feet) tall at the hump and more than 2.5 meters (8.5 feet) in length. Sharp horns, 56 centimeters (22 inches) long, spanning 75 centimeters (29 inches), and borne on a massive, battering-ram skull, may strike with the impact of a 45-kilometer-per-hour (30 mph) charge. The deceptively weak-looking hind legs are used with devastating effect to kill or maim. It is not surprising that wild bison were regarded by early plainsmen as more dangerous than the grizzly and capable of besting any foe.

For all its bulk, a bison is surprisingly agile and has remarkable endurance. It can outdistance any native mammal, running for kilometers at full speed. Poor eyesight is offset by acute hearing and an excellent sense of smell.

Unlike the pronghorn and wapiti, the bison begins its rut in summer. Peak activity occurs in July and August, coinciding with the park's highest visitor use. Since bulls are aggressive and unpredictable during the breeding season, visitors are cautioned to remain in cars when in the vicinity of a bison herd.

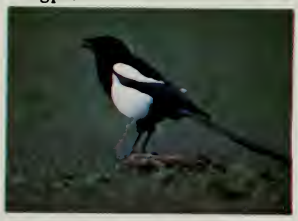
Nighthawk

Birds of the Park

Few birds remain here through the harsh winter–an exception being the omnivorous black-billed magpie. But in spring the midgrass prairie is alive with the color, sound, and movement of birds. The migrating water pipit and long-billed curlew stop during migration to feed on insects. Ground-nesting insect eaters include the western meadowlark and nighthawk. The varied diet of a nocturnal predator, the burrowing owl, and of the diurnal Swainson's hawk (see page 84) includes insects, small rodents, snakes, and even young prairie dogs. The western tanager, one of the most colorful birds in this part of the country, is a summer resident. It feeds on seeds, primarily in the pine forest.

Burrowing owl

Magpie



Long-billed curlew

Western tanager

Water pipit

Western meadowlark

equivalent to a deep plowing of the prairie once every twenty years.

The large bison herd left behind a desolate-looking landscape, but it also left tons of fertilizer. Like the gopher, unaware of the service it performed to its community, the dung beetle busily buried bits of bison droppings on which to lay its eggs. In providing a food source for its larvae, it was helping to rejuvenate the habitat. Because of the activities of such complementary creatures, the temporarily blighted grassland would soon become better than it had been before the bison moved through.

The virtual extermination of the bison destroyed a vital balance in the prairie community, and the grasses suffered for it. The decimation of predatory birds was also harmful. With the settlers came chickens and sheep, and the protection of them led to localized extermination of eagles, hawks, and owls. Suddenly relieved of the incessant pressure of the predators, rodent populations mushroomed, damaging the grassland. The advantages of early sexual maturity, rapid gestation, and large litters had allowed the rodents to survive in the face of relentless predation; then the adaptations turned against the rodents themselves as their numbers rapidly outstripped the capacity of the land to support them.

In nature no organism is more valuable than another, and any unnatural increase or decline in an animal population is a symptom of disorder. Ironically, just as the grassland needed periodic use to maintain the range, so did the rodents require the continual thinning of their numbers to maintain a proper community balance, in which all members, including the rodents, benefited. The lesson of ecology, everywhere displayed on the prairie, is that nothing exists in nature apart from all else.

The Ponderosa Forest

Far out on the prairie stand two mature ponderosa pines. Beneath them two circles of young trees have sprung up, forming a miniature forest slightly taller than the surrounding grass. In the shade of one of the old trees lies a mule deer doe, her large, alert ears twitching at the late summer flies. From the

A ponderosa pine stands in the front ranks between the prairie and the forest.

distant forest comes a gray jay. Alighting on a low branch, it scolds loudly, sending up a meadowlark from among the young trees below and provoking a sharp challenge from a perching loggerhead shrike. Creeping head-down from the backside of the tree trunk, a white-breasted nuthatch issues a nasal "yank, yank," then once more disappears, continuing its search for insects among the furrows of bark.

Here is the site of the contest between prairie and forest.

Wherever the two meet, a silent, continual struggle is waged for domination of the land. Each seeks to invade and usurp the other's domain. Over decades both will make some gains and suffer some defeats, so that the meeting ground is like a no-man's land over which the forces of both can come and go but neither can claim control. The battle is waged so slowly that we would not even be aware of it were it not for the black-and-white head of a gray jay juxtaposed to the bright yellow bib of a meadowlark and the black mask of the shrike.

To the grassland belong the meadowlark and shrike, to the forest the jay and nuthatch. To both and neither belongs the mule deer, a creature committed not to the prairie like the pronghorn nor to the forest like the whitetail, but to the boundaries of each, where both plentiful browse and nearby cover are available.

Wherever differing plant-and-animal communities come together, an intermingling of species occurs. This meeting ground is attractive to species of both communities, and the animal populations thus overlap, creating higher densities than are usually found within either zone. The phenomenon is called "edge effect."

After the land area of Wind Cave came under the white man's control, the forest regions of the park began to increase dramatically. In fact, throughout the Black Hills the forest area has been extended by one third since 1870. The reason is that one of the prairie's greatest allies in containing the forest has been suppressed.

Racing unhindered through the tinder-dry summer grass, wildfire seldom burned hot enough at the soil level to harm the grass permanently. But even such "cool" fires killed pine seedlings. Since grass fires burned often on the natural prairie, pine

growth was confined to the steeper rocky slopes and protected draws beyond the normal reach of prairie fires.

Occasionally, however, pine seedlings would successfully invade the prairie. Like the two old pines that stand alone far from the distant forest line, a few would manage to survive, growing tall enough to escape fatal damage when a fire swept past. In a series of wet years, pines can compete with the deeper-rooted grass, growing rapidly and gaining a foothold on the prairie. Once a few trees become permanently established, the shade and needle litter they produce favor the development of more pines, and the grass is slowly crowded out.

The ponderosa pine, unlike the spruces found at the higher elevations of the Black Hills, is well adapted to the lower elevations of Wind Cave. Capable of rapid growth under favorable conditions, it is drought-resistant and endures the climatic extremes of the prairie. A deep-rooted tree, not easily blown over, it thrives in rocky soil. Most important, because the bark of the mature trees is fire-resistant, grass fires do little or no damage unless they reach high enough to ignite the branches.

Once a mature ponderosa-pine stand is established on a prairie, in fact, it requires grass fires for its survival. Without a periodic clearing away of seedlings, an overly dense stand of trees grows up. These "dog-hair" stands present several problems: they are poor wildlife habitat; they retard individual specimens through severe competition; and, because they provide a perfect avenue for spot fires to reach into the upper branches of mature trees and spread as disastrous "crown" fires, they make the area vulnerable to a devastating forest fire.

The parklike stands of scattered mature pines growing in a prairie habitat represent a truce between forest and grassland, a balance between the communities that fire helps to maintain.

Unfortunately, because of the lack of natural fire barriers and because the small land area of Wind Cave National Park is surrounded by private property, all wildfires here must be extinguished. Since it is recognized that fire is a natural element and unnatural conditions result without it, the only alternative becomes controlled, prescribed burning.

Besides overcrowding and fire, pines face other

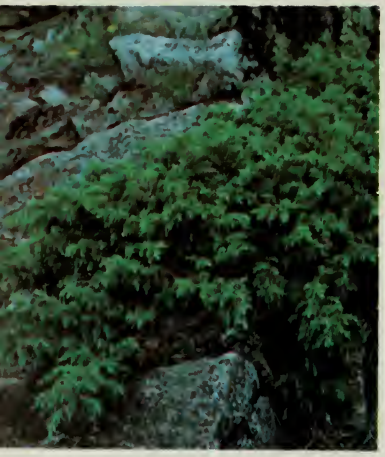
The ponderosa is well adapted to dry, rocky soils, and seedlings take root in what seems to be unlikely places.

The bark of the ponderosa pine is fire-resistant, but the tree's branches will ignite if a fire gets high enough. Resultant "crown fires" can quickly sweep through a forest.

threats. Insect infestation is a problem for any forest. Nearly half of the forest in the Black Hills is estimated to have been infected by the bark beetle, which feeds on the vital cambium layer immediately beneath the tree's defensive outer bark. In the 1960s, a heavy infestation affected an area of thousands of hectares. During 1973 alone, the beetles killed some 600,000 trees. The forests in the Black Hills are generally composed of one or two predominant tree species. Such forests are especially vulnerable to insect infestations.

Young pines are also damaged and destroyed by the activities of mammals. Hungry rodents in winter may gnaw at the bark until the tree is girdled. High populations of porcupines, which in winter feed almost exclusively on tree bark, may cause extensive local damage. In autumn, deer and wapiti, in rubbing the velvet from their antlers, damage saplings; and bison, in scratching their heads, despoil many a young pine. The battered appearance of immature trees at the forest's edge attests to this activity.

In the Black Hills, and in the Pine Ridge area of Nebraska 100 kilometers (60 miles) to the south, the ponderosa pine reaches its easternmost range limit. Although the ponderosa is admirably suited to dry conditions, the influence of the prairie's climate is readily seen in the pines at Wind Cave. Rarely reaching their potential height of 60 meters (200 feet), the ponderosas occur as scattered, stunted individuals or in open stands.



A common juniper sprawls on the relatively open floor of the ponderosa forest.

A walk in the pine forest brings two surprises. The first is the unrelieved monotony of a ponderosa stand: only occasionally is a tree of another species seen. Rocky Mountain junipers, sometimes incorrectly called cedars because of their pungent odor, are widely interspersed among the pines. A small tree–growing no taller than 15 meters (55 feet)–it is extremely hardy. As a result, it is broadly distributed throughout the region and is a common companion to the ponderosa.

A relative of the Rocky Mountain juniper is the low-growing common juniper. Its sprawling, matlike growth provides cover for small ground-dwelling animals in the otherwise open-floored ponderosa forest.

The other surprise in the pine forest is the relative scarcity of observable wildlife. Compared to

A red squirrel sits upright and chatters at intruders.

This porcupine is in a willow, but more than likely you will find them feeding on ponderosa bark.

Your best chances of seeing one or more of the park's several hundred American elk, or wapiti, are early in the morning or late evening.

the crowded, busy prairie, the pine forest seems serene and empty of life. Seed-eating creatures such as the red crossbill and red squirrel are common enough; entering this small, handsome squirrel's territory elicits a chattering outrage, a startling sound that seems all the louder because of the surrounding silence. But because a stand of trees limits vision and mutes sound, many animals are more often heard faintly than actually seen. A woodpecker may hammer, seeking out insects beneath bark, or a wild turkey may call from a distant ridge.

In the forest you probably will hear a red-headed woodpecker before you see it.

Another animal you may encounter is the great horned owl; disturbed from its day roost, it sails zig-zag through the trees, silent as the forest dusk. A porcupine may scuttle out of the way, retreating awkwardly up the nearest tree. Flushed from the forest floor, the poor-will, cousin to the prairie-dwelling nighthawk, flutters up like a giant moth and flits erratically but soundlessly away.

The coyote is a common forest predator. Conspicuous on the prairie, it is seldom glimpsed as it weaves through a stand of trees.

Whitetail deer are rare in the limited forests of Wind Cave, as are the predatory cats, the bobcat and cougar. Another common forest creature, the black bear, is missing. Nearly exterminated from the Black Hills, these large predators, because of their extensive range requirements and intolerance of man, can never be expected to regain their former numbers.

Largest of the park's forest animals is the American elk, second in size only to the moose as the largest member of the deer family on this continent. Although some 350 elk roam Wind Cave in three distinct herds, these timid animals are infrequently seen by day, preferring then to retire to the forest cover to loaf and chew their cuds.

The floor of a mature forest feels springy underfoot. Although a pine forest provides generally poor wildlife habitat, sustaining few large animals, a few centimeters of forest duff supports a staggering animal population. Like the soil of the prairie, forest duff teems with invisible bacteria and fungi; it contains also a surprising number of arachnids, including small spiders, pseudoscorpions, and almost microscopic mites. This is the kingdom of decay, a thin but vitally important stratum where plant-and-animal litter–needles, leaves, feces, twigs, hair,

feathers, carcasses–are broken down by bacteria and fungi, with the result that the basic elements of the dead organisms are again available to the plants. A gram of humus-rich soil may contain as many as 600,000 fungi and more than 20 million bacteria.

Without the continuing recycling action of these decomposers, which break down, each day, a hundred to a thousand times their own weight, the earth's limited quantities of carbon and available nitrogen would soon be locked up; plant growth, the foundation of all life on earth, could not continue.

Since the ponderosa is for the most part confined to the higher elevations, one cannot walk far in it before confronting a sheer dropoff. Looking down into the ravine below, which may be wide and floored with prairie, or narrow and crowded with deciduous trees, you are immediately struck by the contrasts of these two worlds.

Cliffs, Creeks and Ravines

Emerging from the silence of the pine forest, you suddenly make out a chorus of bird song in the canyon below. Before descending, you sit on a rock outcrop and scan the terrain.

To the south of this broad ravine a solitary bull bison is busy at its dust wallow. Where the canyon forks and runs westward, a small band of pronghorn does and kids is passing through a prairie-dog town. Occupying the ridgetops all around this snaking, many-forked canyon floor is a brook, its narrow passage and occasional broad pools crowded by deciduous trees and shrubs of many species. From this ribbon of moist habitat issue the songs of the birds. Most conspicuous are the calls and songs of two red-winged blackbirds challenging each other from the reedy fringes of a pool.

Getting up, you dislodge a rock, which tumbles over the cliff-edge and seconds later pings its impact on unseen rocks. It occurs to you then that from this point you could easily toss a stone into any of three distinct wildlife communities: the forest behind you, the prairie, or the moist woodland below.

Witchity - witchity - witchity - witch, exclaims the warbler with the black eye mask and bright yellow

throat and belly. Darting through the underbrush, it occasionally pauses to examine you, uttering a husky *tchep* alarm note. Wherever water runs, the yellowthroat will be found, singing vociferously.

The alarm calls of the yellowthroat bring out another brightly marked, canarylike bird found along watercourses, the yellow warbler. A large green caterpillar pressed in its bill, it utters a faint, rapid *weet weet weet weet tsee tsee,* then disappears to feed its young.

Here is a fine collection of trees and shrubs. A clump of paper birch grows against the cool, north-facing rock wall; this tree requires a cool, moist habitat and is rarely encountered in the low, exposed terrain of Wind Cave. Several American elms and green ashes border the stream. The short tree with the crooked trunk and irregular form is a box-elder. Farther upstream grows a gigantic plains cottonwood, its triangular leaves trembling in the mildest breeze.

Appearing strangely out of place in this land of sharp contrasts is the bur oak, another member of the deciduous hardwood bottomland society. In this region, the distinctive bur oak, with its contorted branches, ink blot-shaped leaves and fringed acorns, grows only as a small shrubby tree, nowhere approaching the 50-meter (170-foot) height it attains as a major species in the eastern forests.

Many species associated with the eastern and western portions of the continent meet in the Black Hills. The ponderosa pine reaches its easternmost limit here, and the American elm reaches its westernmost limit. This is also true of many bird species. Birds such as the Lewis' woodpecker, western wood pewee, pinyon jay, mountain bluebird, lazuli bunting, and Audubon's and MacGillivray's warblers are on the eastern limit of their range. And such birds as the eastern phoebe, eastern bluebird, and indigo bunting are on their western limit.

The abundant insects and berry-producing shrubs associated with moist bottomlands account for the fact that more bird species are found in this community than in the pine forest. The common chokecherry, American plum, and Fendler woods rose–shrubs that bear fruit prized by many birds–are widely distributed in ravines. In addition, dense thickets of golden currant, Rocky Mountain sumac,

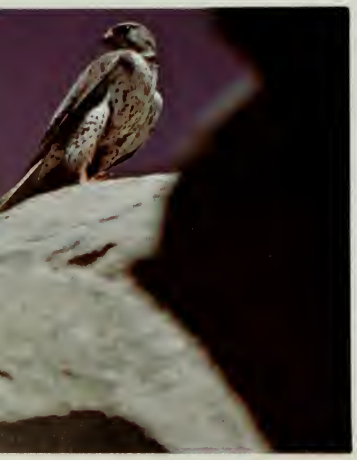
Beaver Creek, left, tumbles from rock to rock in a wooded ravine, one of the transition zones in the park between east and west. In the park the mountain bluebird, above, is in the eastern limit of its range. The upland sandpiper, below, is in its western limit.

and western snowberry provide food and shelter for birds and small mammals such as the eastern cottontail and least chipmunk. Here too is browse for the mule deer.

At night long-tailed weasels patrol the watercourses and meadow voles scurry through the moist grass. Little brown bats fly along the cliff walls for insects, just as the swallows do by daylight.

In the steep-walled canyons of the park, several plant-and-animal communities may be closely associated. The walls form a distinctive habitat and attract many species not commonly found elsewhere.

Cliff swallows seek the protection of overhangs beneath which to construct their mud nests. Golden eagles and prairie falcons occasionally nest on rock platforms wide enough to accommodate their bulky stick nests. Rock wrens, mountain bluebirds, and rock doves commonly nest in the numerous cavities found in the weathered cliff faces.



Rock ledges in the cliffs provide homes for many birds, such as the golden eaglets, above, and prairie falcon, below. Note the eaglets' food supply: dead prairie dogs taken to the nest by the parent eagles.

Since Wind Cave lacks permanent marshes, lakes, or ponds and possesses only two continually flowing creeks (one of which disappears underground shortly after entering the park), many lifeforms associated with water and found elsewhere in the Black Hills are missing here. Shorebirds, marsh birds, waterfowl, beaver, muskrat, and mink will not find a suitable habitat in the park.

Even so, small creeks and pools of standing water are surprisingly crowded with life. The aquatic ecosystem is essentially like the terrestrial. At the base of the food pyramid are the green plants, here chiefly algae, which support an array of herbivorous animals–from the millions of microscopic protozoans to the more conspicuous water creatures such as snails and water boatmen. The plant eaters in turn help support predacious life forms, from the barely visible hydra and an assortment of nymphs, bugs, and beetles to the last link in the aquatic food chain, the brooktrout–which itself falls prey to such land dwellers as herons and kingfishers.

Even a small pool of water presents distinctive habitats, and each has its own association of plants and animals. Many life forms are adapted to living on or slightly below the water's surface film. Free-floating plants such as duckweed occupy this zone, and water striders, fisher spiders, and whirligig beetles skate freely over the water without breaking

through the surface film. The air-breathing larvae of mosquitoes, along with the larvae of some beetles and flies, necessarily spend much time hanging immediately below the water's surface.

On the bottom grow anchored plants. Rummaging through the organic debris are worms, leeches, and the predacious nymphs of dragonflies, mayflies, and damselflies.

Suspended microscopic plants and animals, as well as free-swimming fish, drift through the open water. The predacious diving beetle uses all three of the zones: capturing a bubble of air beneath its wing covers from the water's surface, it will often dive to the bottom, secure itself so as not to float back to the surface, and wait in ambush for a passing meal.

The shoreline habitat extends outward as far as emergent water vegetation will grow. The arrowhead-and-cattail zone along the shore attracts many otherwise terrestrial animals, such as snakes, weasels, and nesting red-winged blackbirds. Shoreline is also the favored haunt of frogs.

Although profound differences of adaptation separate the aquatic and terrestrial communities, neither world is sealed off from the other. As the weasel's foraging along the creek bank would suggest, there is considerable trade-off between the two. A grasshopper, startled to flight, lands on the water and is instantly taken by a trout. From its look-out snag, a kingfisher plunges into a pool and emerges with a fish. Amphibians and many species of insects spend a part of their life cycles within each world, and some reptiles and mammals are at home in both.

Although the ribbons of deciduous woodland in Wind Cave National Park account for very little of the park's land area, they are nevertheless ecologically significant, attracting many plant and animal species that would not otherwise be found in a landscape dominated by prairie or pine.

Seasons in the Wind

The same wind that controls the leaning grasses, sings in the pines, and quakes the woodland leaves brings the slow parade of seasons to the land. Endlessly do the rhythms repeat themselves–from bud

and leaf to branch, from egg and nymph to dragonfly–endlessly obedient to the shadows of the life-giving sun.

The winter has been protracted, the storms severe, and the animals of this simplified landscape, despite the protections of their adaptations, have suffered the severity of the season. The bison appear gaunt, their fat reserves burned away in the long weeks of battling cold and snow to uncover the grass. The unusually persistent snow accumulations have taken a heavy toll on the pronghorns. To survive this difficult season they must rely on vegetation exposed by wind. The warm chinook winds of the winter prairie, which can remove 30 centimeters (12 inches) of snow in an hour, did not arrive when needed most to aid the pronghorn bands.

Coyote kills can also be discovered in the brushy draws and ravines. To survive the winter, mule deer require up to 2 kilograms (4 pounds) of feed per day for each 50 kilograms (100 pounds) of body weight. In summer, when the nutritional qualities and production of plants is high, the deer need feed only during the morning and evening. But in winter, when the abundance and food value of the forage have declined, the animals must feed almost continuously to meet the increased metabolic demands. The juniper, mountain-mahogany, and exposed shrubs have been heavily cropped. But other telltale signs–discolored snow, tufts of fur, and scattered bones–suggest that fewer fawns this spring will inherit the range.

In March the north wind's hold on the plains and hills is finally wrested away, and freshets run in the warmth of midday, releasing the sweet earth-odor of spring. In the wreckage of last year's grass and needles the bright blue goblets of pasqueflowers appear, their silvery pubescence shining in the sun. So numerous were the pasqueflowers on the virgin spring prairie, pioneers called them prairie smoke.

The last storm of winter and the great spring storm of migration often coincide, the air confused with swirling snow, sun lances, and the cries of high-flying geese. Each day compounds the voices from the south. Overhead is the gabble of ducks, the *queedle* of golden plovers, or the loud rattling of sandhill cranes. Soon the grasslands collect sparrows and upland sandpipers.

This sudden infusion of birdsong inspires the winter-silent permanent residents–the horned larks on the prairies; robins, goldfinches, and Townsend's solitaires in the brushy ravines; woodpeckers, chickadees, white-winged juncos, and red crossbills in the forests–until the landscape seems magically transformed, one day empty and austere, the next busy and bewildering.

Sharp-tailed grouse take to the high knolls to celebrate the lengthening days in dawn rituals of courtship. Booming, strutting, rocketing to and fro with wings extended, cocks vie for hens and spring stirs the earth.

The increasing stature of the sun coaxes from the prairie a legion of pasqueflower and common starlily. Soon, on the forested slopes, will stand the trembling torches of darkthroat shooting-stars, their petals burning blue fire in the cool, moist, pine-scented air.

Cool-season grasses such as western wheatgrass and the non-native Kentucky bluegrass begin to green, racing to produce seed before the hot days arrive; they are soon supplanted by the warm-season little bluestem and blue grama.

In May, orange-red calves are with the bison on the prairie, and wapiti lead ungainly calves through the pine forest. Mule deer does hide their twin fawns in the forested bottomlands, sweet with the scent of blooming chokecherry and plum. Bees, visiting clumps of Rocky Mountain iris in a moist prairie depression, pass over inert, undappled pronghorn kids in a "kidding ground." Like the mule deer fawns, pronghorn young are scentless and lie motionless to avoid detection during their first critical days of life.

June is the season of replenishment, the time the lesser creatures begin to rebuild their winter-thinned numbers. Four to seven newly born, blind cottontails–the first of as many as five litters a doe will bring forth during the summer–squirm in their hair-lined nest in a plum thicket.

Hanks of shed bison hair–eagerly sought by nest-building birds–litter the prairie. Infested with the barbed seeds of grasses and forbs, a patch of discarded hair helps sow the prairie, which now blooms yellow and white and blue with pricklypear, yucca, and spiderwort.

Six-week-old prairie dogs make their first unsteady appearance above ground in mid-May from the dark, deep burrows in which they were whelped. Recently roused prairie rattlesnakes and bullsnakes feast on ground-nesting birds and small mammals. The delicate blooms of the early-season forbs give way to the bold, conspicuous yellow blossoms of summer. Black-eyed susans, sunflowers, and prairie coneflowers claim the land while the day temperatures soar, sending snakes and prairie dogs below ground to escape the breathless heat. Grasshopper nymphs become noticeable; soon adults will clatter through the drying grass.

East, west, north, and south the cumulus clouds build, often blotting out the afternoon sun. Summer heat constructs the thunderstorms, a force that buds on a windless morning and builds to afternoon anger, like the bison bulls that grow increasingly short-tempered in their rut of mid-July.

In the forest, young red squirrels peer out from their pine-trunk nest holes. For them, the remaining summer days will be a game of hide-and-seek, a time of play similar to the ease enjoyed by the coyote pups not far away.

When the goldenrod bears its yellow plumes and grasshoppers have gained ascendency over the grasslands, the nights again grow cool. Drying grasses sigh with the wind. Flocks of blackbirds descend here and there; a hen turkey marshals her outsized brood across an opening in the pines; and the pinyon jays, conspicuously silent during the nesting season, pierce the air once more with calls, complaints, and squabbles.

By September, the grassland has slipped through its complete seasonal succession of flowering forbs, finishing out the summer in a flourish of asters. Heavy with seed, grasses sparkle with dew longer now in the cold mornings. It is time for the wind to sow the seed, for the deer mouse to lay up its winter seed stores, and for the yellow-bellied racer and hognose and garter snakes to seek their dens.

Again the bison have covered their ribs with fat; the calves have grown hefty. Already the herd wears its dark, long winter coat, and the bulls have wandered off to their different ranges, returning to the cows only infrequently. Pronghorn bucks vie with one another to assemble their harems, which often

consist of twelve or more does. In the woodlands, spotted red by the turning sumac, mule deer bucks prepare for their November mating season. In summer, their tawny pelage matched the color of their bulbous, sensitive velvety antlers; but now their coats shine a sleek dark gray and their antlers are bone, honed smooth by brush and sapling for the business of autumn.

One day, the sun will rise in summer and set in fall. This change will be announced by the bull wapiti, their sharp bugling piercing the morning's calm. The clarion seems to hurry a red complexion into the little bluestems and to shake the yellow leaves of the cottonwood groundward in a constant rain. Again the voices of snow geese, again the dustings of snow, October squalls, settling silence.

On this porcelain January dawn the bison face squarely into the blizzard, standing their ground in a remorseless time, their long beards and heavy coats white with clinging snow. Bedded down on a lee ridge slope, a band of pronghorn watches the white emptiness of their prairie and the gray, obscured horizon of pine. Across the deserted dog town a coyote sniffs the swirling air from the entrance of its hillside den. In the forest, slanting sleet obscures a long line of tracks left by a coyote patrolling its hunting orbit. The hidden traffic of mice continues beneath the life-saving insulation of the mounting snow. In the crushed, buried grass, seeds of another season wait the returning genius of the sun.

Let the storm proceed. In this white form the wind continues to rule, as it has for countless prairie days.

Guide and Adviser

Visiting the Park

Location Southwest South Dakota 16 kilometers (10 miles) north of Hot Springs on southern flanks of Black Hills.

Area 11,353 hectares (28,060 acres)

Elevation From 1,128 to 1,528 meters (3,700 to 5,013 feet)

Climate Temperatures range from winter lows of −32°C (−25°F) to summer highs of 35°C (95°F) or higher. Winters are generally pleasant with extended periods of little or no snow and temperatures are normally about 4°C (40°F). Average annual precipitation is 41 centimeters (16 inches) with winter snows providing less than half of the total.

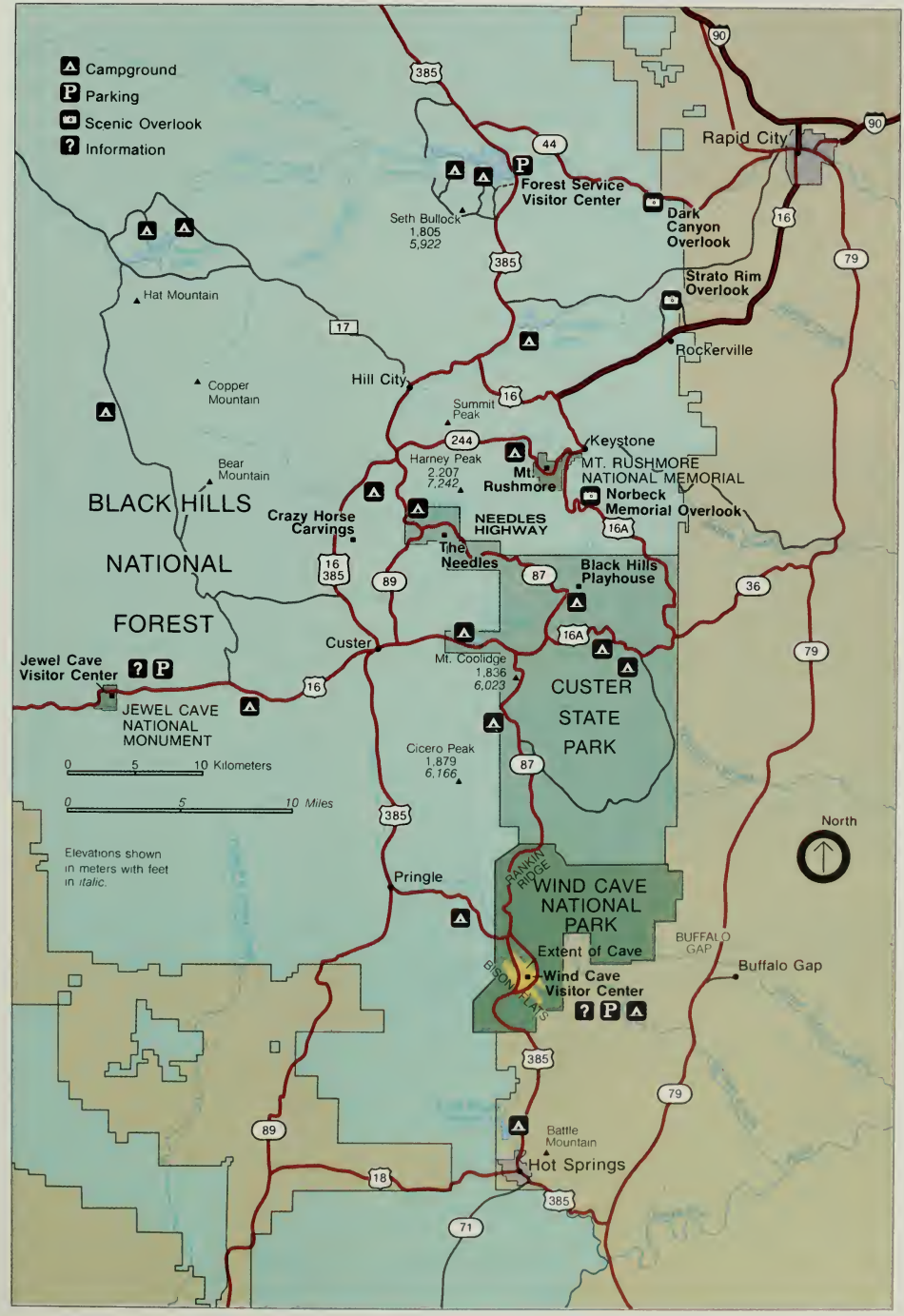
Best times to visit Summer is the most popular time to go to the park, but the weather then is warm to hot with occasional brief afternoon thundershowers. If you wish to avoid crowds, visit the park in spring, fall, or winter. Many of the Black Hills attractions are open only from Memorial Day through Labor Day. The weather in the fall is generally warm and pleasant and the spring blustery. Though winters are generally moderate, occasional severe snowstorms, icy roads, lack of accommodations, and closed tourist attractions discourage most would-be visitors. Check on weather conditions ahead of time.

Access *Highways*–From Rapid City, South Dakota, take U.S. 16 to Custer, then U.S. 385 to park, or S. Dak. 79 and U.S. 18 to Hot Springs, then U.S. 385 to park; from Custer State Park, take S. Dak. 87 to park. From Hot Springs, South Dakota, take U.S. 385. *Buses*–No buses stop in the park, and connections are extremely poor. *Railroads*–Nearest rail passenger service is in Cheyenne, Wyoming. *Airport*–The Rapid City Airport is served by a few commercial airlines. Cars may be rented there.

Visitor Center Obtain cave tour tickets and a schedule of park activities here. A ranger is on duty to help answer your questions. Exhibits explain the area's human and natural history. Concessioner sells sandwiches and light lunches in the summer.

The park has only one campground, but, as the map indicates, there are plenty of publicly operated campgrounds in the Black Hills area. Most of them are run by the U.S. Forest Service.

Cave tours Rangers lead normal tours of 75 or 105 minutes and special historical candlelight and


Campground
Parking
Scenic Overlook
Information
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Rapid City
Forest Service Visitor Center
Seth Bullock 1,805 5,922
Dark Canyon Overlook
16
79
Strato Rim Overlook
Hat Mountain
17
Rockerville
Copper Mountain
Hill City
Summit Peak
16
Keystone
244
Harney Peak 2,207 7,242
Mt. Rushmore
MT. RUSHMORE NATIONAL MEMORIAL
Norbeck Memorial Overlook
Bear Mountain
BLACK HILLS
Crazy Horse Carvings
NEEDLES HIGHWAY
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The Needles
NATIONAL
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Black Hills Playhouse
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FOREST
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Jewel Cave Visitor Center
Mt. Coolidge 1,836 6,023
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WIND CAVE NATIONAL PARK
Extent of Cave
BUFFALO GAP
Buffalo Gap
Wind Cave Visitor Center
BISON FLATS
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79
89
Battle Mountain
Hot Springs
18
385
71

spelunking tours in the summer. Daily tours are provided the rest of the year except December 25 and January 1 but on a less frequent basis. A fee is charged for each type of tour. Because the cave trail is dimly lit and the trail surface is often wet, wear low-heeled walking shoes with non-slip soles. Do not wear sandals or shoes with leather or hard composition soles. The cave temperature is about 12°C (53°F) at all times, so a light jacket or sweater is suggested.

Cave statistics Natural entrance 1,245 meters (4,084 feet) above sea level; highest point 1,268 meters (4,161 feet); lowest point 1,098 meters (3,601 feet); vertical extent 171 meters (560 feet); east-west extent 1,067 meters (3,500 feet); north-south extent 1,372 meters (4,500 feet); cave temperature 12°C (53°F). Wind velocity varies; it is determined by the difference in barometric pressure between the cave and the surface. It has been measured in excess of 80 kilometers per hour (50 mph).

Today, a plaque marks Alvin McDonald's grave, a short walk from the visitor center.

Surface activities Look for bison, prairie dogs, pronghorn, mule deer, wapiti (elk), and many species of birds. Evening campfire programs about the park are presented in the Elk Mountain Campground during the summer. A schedule of ranger-guided activities may be obtained at the visitor center.

Camping Elk Mountain, the park's only campground, is operated on a first-come, first-served basis from mid-May through mid-September, depending on the weather. A fee is charged. Wood, water, picnic tables, comfort stations, and fireplaces are provided. Campfires are limited to fireplaces, but cooking on gas or other types of portable stoves is permitted. Camping supplies, and electrical, water, and sewer hookups are not available in the park.

Other accommodations Motels, hotels, trailer courts, camping supply stores, and service stations are in the towns of Hot Springs and Custer, South Dakota. Many private and public campgrounds are located in the southern Black Hills near the park.

Establishment of park January 9, 1903. Boundary changes March 4, 1931; August 9, 1946; November 10, 1978. Wind Cave National Game Preserve, established August 10, 1912, added to park June 15, 1935.

Mailing address Hot Springs, South Dakota 57747.

Park Regulations

Regulations have been established to protect you and the park environment. Please observe them.

Natural Features It is unlawful to disturb, injure, destroy, deface, or remove any vegetation, rocks, minerals, or cave formations. Do not even touch the cave formations and walls. Delicate crystal growths and boxwork are easily destroyed, and oils of the skin discolor the cave.

Wildlife The park is a sanctuary for wild animals. Do not chase, harass, attempt to catch, or feed any park animal. Hunting is not permitted in the park. Firearms and other weapons are permitted only if they are packed so as to prevent their use.

Pets All pets must be kept in vehicles, or caged, or leashed when in the park. They are not permitted in the cave or public buildings.

Traffic Drive carefully to protect yourself, other visitors, and wildlife. Observe traffic signs. Park roads are also used by through traffic and commercial vehicles. Do not obstruct traffic by stopping on the road; pull over and let faster moving vehicles pass. Driving off roadways is prohibited because it creates permanent damage to the delicate prairie. Park on road shoulders or at parking areas only.

Sanitation Camp only at the campground. Dump wastes and wash water in special sinks at the restrooms, not on the ground. Littering is irresponsible as well as unlawful; trash cans are provided at convenient places throughout the park. Please use them.

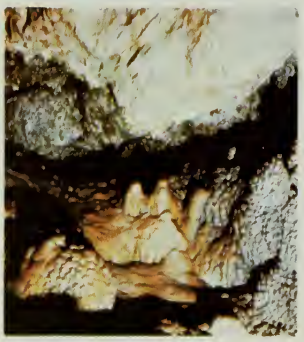
Fire Prevention Fires are permitted only in the fireplaces found in the campground and must not be left unattended. Help prevent destructive and costly fires by thoroughly drowning all campfires with water. While in the park, you may see a prescribed fire or the results of a prescribed fire. Prescribed burning is a new resource management activity and is used experimentally to obtain more natural environmental conditions. Such fires are ignited by authorized park personnel under stringent and controlled conditions. If you would like more information about this management program, ask one of the rangers or inquire at the visitor center.

It's not wise to get this close to the bison. They might appear docile, but, remember, they are wild and might charge you any time. It's best to stay in your vehicle.

From the fire tower atop Rankin Ridge rangers keep a sharp lookout for fire, and visitors enjoy a panorama of the park.

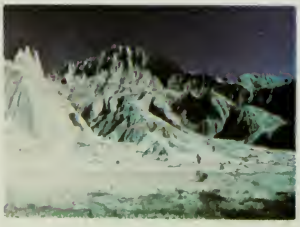
Nearby National Parks

While you're in the Black Hills, why not see what else the National Park System offers nearby? Mount Rushmore needs no introduction. Jewel Cave will broaden your spelunking credits after Wind Cave; the differences between the two are astounding. And you owe it to yourself to see how the Badlands got their name. You've probably seen them in old cowboy films, or conjured them up in your own imaginings. Here's your chance to see what they're really like. A century ago this was the western frontier, the Dakotas.



Jewel Cave National Monument is located on U.S. 16, 24 kilometers (15 miles) west of Custer, South Dakota. The cave's name comes from the myriads of jewel-like calcite crystals that adorn its walls. The cave has several other kinds of formations in a variety of colors. A few animals, including five species of bats, inhabit the cave. Plantlife is confined to a pine forest. Tours are conducted daily from mid-May through September. Tours, if any, the rest of the year are irregular. The park does not have overnight accommodations or camping facilities. Mailing address: Custer, South Dakota 57730.

Mount Rushmore National Memorial is 40 kilometers (25 miles) southwest of Rapid City, South Dakota. The mountain sculpture of Washington, Jefferson, Theodore Roosevelt, and Lincoln is best viewed under morning light. From June 1 to Labor Day the faces are illuminated at night and evening programs are presented in the amphitheater. Mailing address: Keystone, South Dakota 57751.



Badlands National Park is 97 kilometers (60 miles) southeast of Rapid City, South Dakota. This wonderland of bizarre, colorful spires and pinnacles, massive buttes, and deep gorges is open all year, though blizzards may temporarily block roads in the winter. Campfire programs and guided nature walks are presented. Backpackers will enjoy the park's wilderness area. The park has a herd of about 300 bison and some prairie dog towns. Mailing address: Interior, South Dakota 57750.

So You Want to be a Caver?

by William R. Halliday

Perhaps YOU have dreamed of becoming a caver.

Chances are that it is easier than you think. Caverns of some kind are located within week-end driving distance of every part of the contiguous United States. Your fellow cavers in the National Speleological Society are eager to see that your start is safe and proper.

No one can learn caving from a book. The National Speleological Society has over 5 thousand members throughout America and some 200 organized units–its grottoes or chapters. Nearly all will be delighted to welcome you, for we have not forgotten that not long ago we too were novices. Through perhaps a half-million man-hours underground, we have learned much of what is best for caves and cavers. Cavers today need not repeat our quarter century of trial and error. . . .

Before overcommitting yourself, visit some of our commercial caves. Some of our most enthusiastic prospective cavers have paled at their first realization of the eternal underground night.

Even after you have contacted the society, don't commit yourself to expensive equipment until you have tried out simple caves that need only routine care. Outstanding outdoorsmen have panicked when first nose-to-nose with a hibernating bat in a crawlway. Your local grotto or society members can suggest easy caves for your first few explorations. Indeed, many of them conduct frequent practice trips for those seeking experience. . . .

You will be in little danger if you always consider caving inherently dangerous and thus respect the cave properly. Watch for each hidden peril and determine the best way of countering it. Never attempt anything which might be beyond the capability of the weakest member of your party. Never attempt to show off *your* strength or skill. Never hesitate to turn back and return some other day. Never allow anyone to be alone in a cave. This means that you must have at least four in your party so that, if someone is injured, one person can stay with the victim while *two* go for assistance. (If somehow you find yourself alone in a

Old work clothes, a helmet, gloves, and sturdy boots are essentials for spelunking.

cave, sit down *right there* and wait.) Always tell someone reliable where you are going and when to send out the rescue party if you have not turned up. Keep in mind that it usually will take you much longer to get out of the cave than you think.

Always carry three sources of light, with complete replacements for each. Most cavers usually depend on a carbide lamp affixed to their helmets. Very dependable and easily cleaned, the lamps throw a wide, even glow of surprising intensity. Others prefer an electric headlamp despite the nuisance of the wires. . . .

The second source of light is usually a spot-beam flashlight for long-distance illumination. If crawling is expected, the two-cell length is almost mandatory. . . .

The third source of light depends on your particular preferences and needs. In great throughway corridors–of limestone or lava–a gasoline lantern may become the main source of illumination. At the other extreme, many a worried caver has returned to the surface by candlelight when all else failed.

Do not forget replacements and fuel for *each* light source. Besides the standard cleaning and spare-parts kit for carbide lights, I always carry two pounds of carbide and a pint of water (which probably provides an unnecessarily wide margin of safety) and a set of batteries and bulbs for *each* flashight. . . .

Look at the dents, scars, and scratches on the helmet of any experienced caver. Few have been hit by falling rock, but all of us have banged our heads hundreds of times. Soft miners' caps do not protect against scalp cuts. A considerable variety of helmets is available. Any adequate narrow-brim type with a lamp bracket and chin strap is probably satisfactory for beginners. Later you may want to advance to a type which will protect your head if you fall on it.

Never use a rope found in a cave. Despite outward appearances, either wet or dry rot affects ropes within a very few days. Too many cavers have died this way. Even if you don't care how you die, don't saddle your friends with the revolting task of recovering your rock-mangled body.

Furthermore, never use your own ropes underground unless you are trained in standard mountaineering techniques on the surface. When ropes are wet and muddy, they cause even experienced cavers untold grief. And unless you are on belay, *never never*

never consider climbing a rope hand over hand even a few feet.

Never drink unsterilized cave water unless you are on a watershed. . . . Filtration of bacteria is almost absent in cavern streams, and epidemics have been transmitted many miles in limestone terrain.

Remember that cave passages will look different from the opposite direction. If side passages seem to be joining as you enter, they will be diverging as you return, and you may easily select the wrong one. It is easy to find your way into a large chamber from a small passage, but to find the small passage from inside the room is a different matter. Monuments of piled-up rocks are the best guides. Fragments of reflective tape are also useful. No one today uses twine, the stand-by of the pioneers. Transcontinental caver George Jackson settled this concept years ago: "If you can carry enough twine to do any good, the cave isn't large enough to stay lost in!". . . .

If somehow you manage to become hopelessly lost, sit down and wait for the rescuers who will inevitably come. Be thankful that you told someone where to look for you; it will save two or three days' unpleasantness. STAY WHERE YOU ARE, especially if your lights fail. . . .

When you visit commercial caves, remember that they are in the business of entertaining people, not education. It is courteous to introduce yourself and show your N.S.S. card. Some will welcome you, especially if you don't sound like a capper or an ulcer-ridden professor. Others are much too harried.

Of particular importance to your fellow cavers is your attitude toward the conservation of their splendid netherworld. It takes only a few minutes for a thoughtless or psychopathic individual to undo natural beauty that took millions of years to create. . . . If twenty persons break only one stalactite apiece, significant harm is done to a splendid cave. Do not collect either animal or mineral specimens in caves unless you are part of an authorized research project. . . . In caves within the National Park system, permits are necessary for *all* collecting. . . .

You can't expect to learn everything at once. None of us has done so. Go cautiously and refer frequently to your reference sources, human and written. The average cavers will not scorn your simplest question. Good luck and good caving!

Other Caves to Visit

Besides Wind Cave and Jewel Cave the National Park System includes several other caves.

Carlsbad Caverns National Park is on U.S. 62-180, 32 kilometers (20 miles) southwest of Carlsbad, New Mexico. The largest of more than 65 caves in the park has one room with an area of 14 football fields and enough height for the U.S. Capitol in one corner. Stalactites, stalagmites, helictites, and flowstone draperies adorn the many chambers. Tours are given daily. Mailing address: 3225 National Parks Highway, Carlsbad, New Mexico 88220.

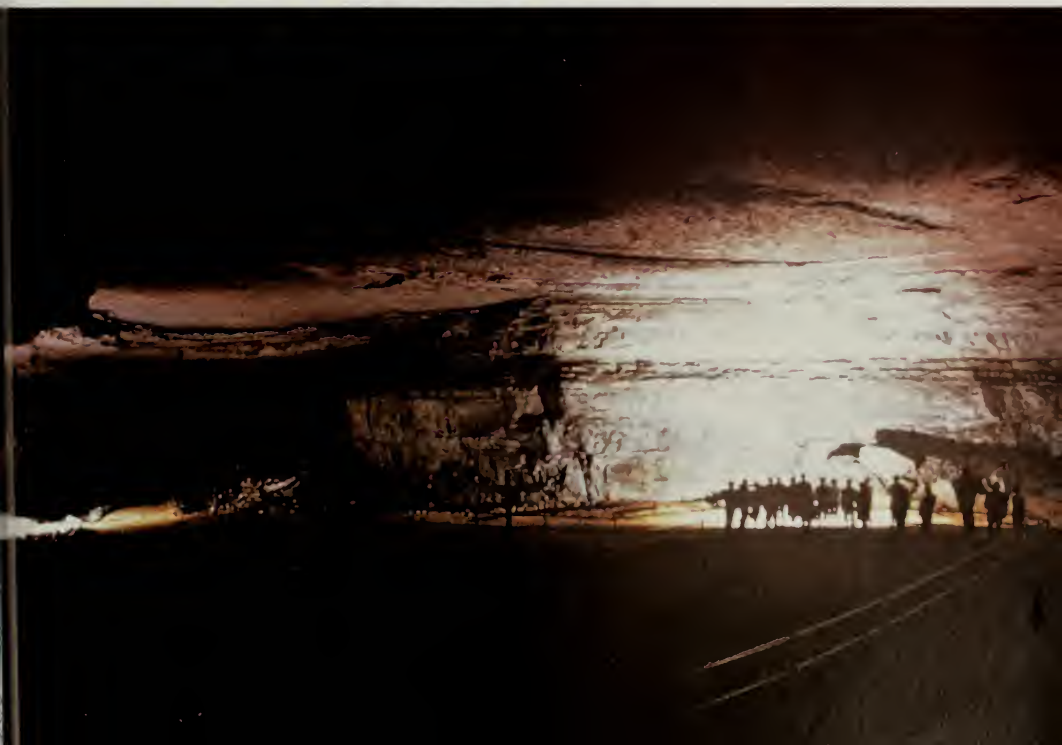
Lehman Caves National Monument is on Nev. 73, 8 kilometers (5 miles) west of Baker, Nevada, near the Utah border. The cave is 2,080 meters (6,825 feet) above sea level and about half way up Wheeler Peak. Daily, visitors are guided over a 1-kilometer (0.6-mile) trail through varicolored columns, draperies, helictites, and rare shields, or pallettes. Mailing address: Baker, Nevada 89311.

Mammoth Cave National Park is on Ky. 70 near Brownsville, Kentucky. An underground lake, rivers, and eyeless creatures are all parts of this park. About 320 kilometers (200 miles) of caverns have been explored. The cave has been used for mining saltpeter, concerts, church services, weddings, and as a tuberculosis sanitarium. Tours of 1½ to 6 hours are given daily except December 25. Mailing address: Mammoth Cave, Kentucky 42259.

Oregon Caves National Monument is on Oreg. 46, 32 kilometers (20 miles) southeast of Cave Junction, Oregon. Dripstone, fragile soda straw stalactites, and flowstone are among the many exquisite formations. Tours are given daily. Mailing address: 19000 Caves Highway, Cave Junction, Oregon 97523.

Timpanogos Cave National Monument is on Utah 92 south of Salt Lake City. To reach the entrance you must hike 2.4 kilometers (1.5 miles) up Mount Timpanogos. A filigree of white translucent crystals makes the cave walls sparkle like jewels. Pencil-like helictites extend out in all directions. Tours are given daily May through October. Mailing address: RFD 2, American Fork, Utah 84003.

The Green Lake Room at Carlsbad Caverns, top right, and The Rotunda at Mammoth Cave offer different subterranean experiences in size, scale, and color.



A Cave Glossary

Here are a few terms that you might hear when taking a tour of Wind Cave or any other cave:

Aragonite A form of calcium carbonate generally appearing as needlelike crystals.

Bacon-rind Formed on ceilings in thin, wavy sheets; contains parallel bands of light and dark colors, thereby resembling bacon.

Blowing Cave Changes in atmospheric pressure cause air to blow either into or out of caves for extended periods of time, thus giving the impression that the cave is actually creating the phenomenon.

Boxwork A complex system of interlocking thin plates of calcite that project from walls and ceiling.

Calcite Formed from calcium carbonate, this is the most common mineral in caves.

Carbonic Acid This is a very weak acid created by the combination of carbon dioxide and rain or ground water. The acid slowly dissolves limestone to create caves.

Cave A natural chamber or series of chambers underground in perpetual darkness and large enough to enter and walk through.

Chert A hard, dull, flint-like substance that occurs in limestone.

Chimney Any shaft, round or a cleft, in rock.

Column A fused stalactite and stalagmite.

Dead Cave A cave in which formations no longer grow because water and moisture no longer appear in the cave.

Dolomite A sedimentary rock with high concentrations of magnesium carbonate in which caves can be found.

Drapery A hanging, thin formation often folded upon itself like a curtain.

Dripstone Formations built up by the action of dripping water.

Fault The point of contact between two moving land masses or the plates of the earth's crust.

Flowstone A mineral coating, usually calcite, deposited by water flowing over or down a wall.

Frostwork Delicate calcite crystals that look like frost.

Grotto A small chamber off a much larger room. It can also be an opening into a cliff or wall that does not extend into complete darkness.

Guano Bat droppings, a rich and valuable fertilizer.

Helictite A twisted stalactite that hangs at any angle other than the perpendicular.

Joint A crack in rock caused by natural processes.

Karst Landscape characterized by sinks, sinkholes, disappearing streams, and underlain with limestone riddled with caves.

Limestone A sedimentary rock composed primarily of calcium carbonate and easily dissolved by carbonic acid.

Live Cave A cave still being affected by water whether in enlarging of passages and rooms or in creation of formations.

Lost River A river that runs underground for a portion of its course.

Marble Crystallized limestone greatly changed by heat or pressure.

Moon Milk A white, soft, putty-like substance. Mainly calcite and hydromagnesite.

Phreatic Zone The area of saturation below the water table; spaces in this area are filled with water.

Saltpeter Nitrate deposits; used in the production of explosives.

Sinkhole An opening leading directly into a cave; may be in a sink, caused by collapse of the underlying cave.

Soda-straw Stalactites A thin hollow stalactite through which water drops to the floor.

Spar (Dogtooth) Calcite crystals that resemble a dog's tooth.

Speleothem Any mineral deposit left in a cave by dripping or running water.

Stalactites Mineral deposits hanging from the ceiling of a cave formed by the action of dripping water.

Stalagmites Mineral deposits on the floor of a cave that grow upward as water drips down either from the roof or from a stalactite directly above.

Syncline A trough or downward fold in sedimentary rock.

Vadose Zone The dry area above the water table; water in this zone is pulled downward by the force of gravity.

Water Table The line between wet and dry areas.

Serendipity

by Freeman Tilden

If you do not happen to be familiar with the word *serendipity*, let me save you the trouble of looking it up in the dictionary.

Horace Walpole invented it by one of those fortunate verbal inspirations. In spite of the half-million or more English words at our disposal, for most of which we have no need, this one filled a niche that had been left open. It is a noun that expresses an experience as old as human life itself, yet one that almost requires the experience itself to define.

In a letter to Sir Horace Mann, Walpole said that he had just been reading a "silly fairy tale" called *The Three Princes of Serendip*, in which the princes went journeying to find certain valuable things and by "accidental sagacity" found, not those things they sought, but much better ones.

The "silly fairy tale" has gone the way of countless mayflies of literature. I have found no mention of the book in the vast Congressional Library. We do know that Serendip was really Serendib, the ancient name of Ceylon. It was on the island of Ceylon that Adam and Eve, expelled headlong from Paradise, landed. Of that, no possible doubt. The proof may be found there on a certain rock, where Adam's footprints are clearly seen.

So the dictionary, always open-minded about new words, defines *serendipity* as "the gift of finding valuable or agreeable things not sought for."

A friend of mine, a harried businessman of large and vulnerable affairs, felt himself one day during the depression of the 1930's about to crack under the strain. He packed a bag one day in mid-April and went into the north country to fish down a brook he had known as a boy. The brook was a good one, but the water was high and icy cold, and he fished for several hours without a single strike. Suddenly he saw something gleaming brightly in still water along the roots of an overhanging tree. Curious about it, he rolled up a sleeve and went after it. It was only a piece of green tourmaline, one of the common silicate minerals in a granite-rock country. But what a piece of tourmaline it was! Better than mere gem quality,

"The morning dawns clear. The clouds begin to gather. . . . You came to find one nugget: you have uncovered a treasury of gems."

it was a perfectly formed crystal, such as any museum would be proud to display. My friend, with not the least idea of what the specimen was, took it to a lapidary, who immediately offered to buy it. Of course, it was not for sale. Instead it formed the nucleus of a private mineral collection that is now one of the best I know. It developed a fascinating hobby in a man who needed a hobby at that time more than anything else in the world. He got no fish out of his trip, but he acquired a life-preserving interest. That is serendipity.

A pioneer, hunting game, wounds a bear. The bear escapes into a cliffside and disappears among the rocks. After searching for some time, the hunter finds a hole into which the bear had gone and straightaway goes in after him. He finds himself in a cave not hitherto known to exist. He has discovered, in fact, the cave now known as Mammoth Cave of Kentucky. Serendipity.

A chemist, plying his quest for a certain needed industrial substance, confesses his defeat after long days of experiment, and then discovers that he has stumbled upon something he had never sought at all– the basis of a drug that is later to prove a boon to suffering mankind. Serendipity.

A party of astronomers, with infinite attention to details, makes a long and expensive trip to a certain spot on the earth's surface where the eclipse of the sun will be very nearly total. Everything is ready. The morning dawns clear. The clouds begin to gather. The sun vanishes. Nature turns surly, will have no spectators at that place and moment. But by "accidental sagacity" other phenomena are noted on that venture which are more revealing than the solar corona it was planned to watch. That is serendipity.

There is no need to multiply instances. Hardly one of us has not had this experience of seeking for a much-desired thing only to find that the undreamed-of fruit of the search was the truer good. Walpole was poking sly fun when he spoke of "accidental sagacity"; sagacity is no accident. The sagacity of the three princes of Serendip consisted in searching for things worth finding. The unexpected dividends were rewards for that.

At this point I surmise the shrewd reader will say: "I see where this talk about serendipity leads: we are now going to have Horace Walpole's word

hitched to something about the national parks. The sermon is about to begin!"

Well, then, I am detected in my furtive design, except that there is no sermon. It will be just a leaf from a stout volume of personal experience.

When, many years ago, I made my first visit to a national park, if I had any definite ideas at all about it, it was "for to see and for to admire" those things which had been pictured and described to me, and in a general way for what I thought of as a holiday recreation. If I had anything faintly resembling an intellectual or spiritual approach, I certainly cannot recall it. And to this day I should suggest that one beware the intellectual and studied attitude. It is self-defeating and an enemy of joy. The first contact with the wilderness parks, at least in their wilderness aspects, should be as round-eyed as that of children. The deeper meanings of what is seen will come in their proper time. Those are the serendipities.

Yet, too, I remember that I came away from that park–it was Yellowstone–with a pleasurable restlessness of spirit. The park had done something to me, something challenging and vital. Unskilled as I was, I perceived that what I had seen, though fascinating and unforgettable, was *not* Yellowstone. It was only part. Behind the visual was the soul of the thing–a unity more beautiful than the falls, more mysterious than the geyser basins, more prodigious than the canyon. In whatever national park I have since been, it has always been likewise. As for the beauty, it never palls; as for the sense of healing quietude, it is never lacking; as for the meanings, I am still at school; but the parks have provided me with much of the most refined satisfactions of my life. I owed it to them to say as much. . . .

There is no harm in going to the parks with the impression that they are places for recreation, in the ordinary sense of that word. A single trail trip through the unspoiled country, with glimpses of its manifold mysteries and marvels, and chance acquaintances with the creatures that live within it, will change the concept for all time. Your word will be *re-creation* after that. The plow will have turned up long-buried possibilities of higher enjoyment than the physical thrills that were sought. Recreation into re-creation: that is serendipity.

The more you come to know the national parks,

the more the hidden assets begin to appear. You never come to the end of them. They are seldom the things the eye first sees; they are nearly never the things avowedly sought. To this very day I frequently go into an area with the definite view of spending my time on some certain thing, only to find that this purpose has given way before a new interest that charms me more. Thus I am a Prince of Serendip.

John Merriam was once saying: "For those who go down into the (Grand) Canyon to set their feet upon the strands of early time, or to lift with reverent fingers the trace of a fern that for years in untold millions has rested on the bank, there are places where history not merely reveals itself, but for everyone seems waiting to tell its story . . . and the whole panorama represented in the Canyon wall *becomes a thing of life.*"

For those who go down into the canyon! First you stand at the rim and view the grandest spectacle of its kind in all the world. But then you go down into the canyon. The story unfolds. The mysteries deepen. The meaning widens. The whole overpowering fact becomes a thing of life. You came to find one nugget: you have uncovered a treasury of gems. *You*, too, are a Prince of Serendip.

The national parks are preserved for all such adventuring princes; in this case, for you and me.

Coming across a tepee ring is one of the unexpected pleasures of a stay at Wind Cave National Park.

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Credits

Robert D. Woodward, author of *World of Darkness* in Part II, is a former Washington newspaperman who now teaches journalism at Drake University. Greg Beaumont, author of *World of Light,* is a writer, photographer, and naturalist who lives in Muscatine, Iowa.

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Greg Beaumont photographs: Pages 13, 81 (boxwork), 84, 88 (mariposa), 89 (pasqueflower, starlily, spiderwort, shooting star, soapweed), 92, 94, 96-97 (enjoying, grooming, fattening, gathering), 98 (bulldozing, sounding), 101 (whitetails), 104-105, 109 (ponderosa), 110, 111 (red squirrel, porcupine), 112, 115, 116.

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U.S. Department of the Interior

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